奇电科技
QIROD TECHNOLOGY

QD200 Series Frequency Inverter

USER'S MANUAL

QD200 Series Frequency Inverter

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English Version

Shanghai QIROD Electric Science & Technology Co., Ltd.

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1. PRELUDE

Thank you for using QD200 series frequency inverter manufactured by Shanghai QIROD Electric Science & Technology Co., Ltd. QD200 series inverter, independently developed by our company, is a universal vector control one that owns high quality, multiple functions and low noise.

This User's Manual offers complete introduction of installation and use of the frequency inverter, setting of function parameters, fault treatment and maintenance etc for QD200 series inverters.. Please carefully read this manual before use in order to guarantee correct installation and use of the inverter.

This manual is an accessory along with the machine. Please keep it properly for the future use for repair and maintenance.

1.1. Labels concerned with safety

The following symbols are applied with regard to the content related to safety in this manual. The description with safety symbol is of great importance and should be complied with.

DANGER
• Wrong operation may result in death or severe injury.

WARNING
• Wrong operation may result in death or severe injury.

CAUTION
• Wrong operation may result in slight injury or damage to equipment.

1.2. Notice for package opening and check

CAUTION
DO NOT try to install inverter damaged or lacking components, otherwise there is risk of fire or casualty. When opening the packing box, please carefully check and confirm: • Whether there is damage to the product. • Whether the product model conforms to the requirement of your order. Please refer to the MODEL column in the nameplate at the side of the inverter for the model. If you find there is problem in the product or the product does comply with your order, please instantly contact Qidian's distributor or sales departments of Qidian for solution.

2. TYPE AND SPECIFICATIONS

2.1. Plate of frequency Inverter

The nameplate shows the type (model), specification, batch number and protection level etc.

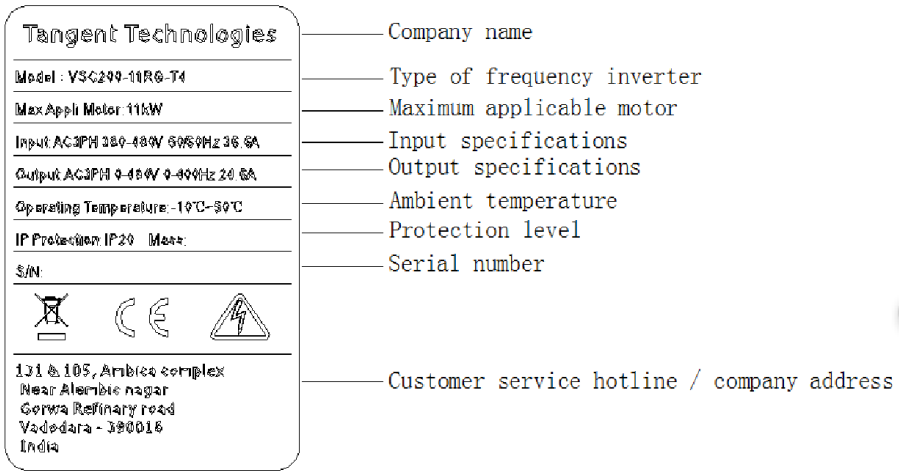


Figure 2.1 Sample of frequency inverter's nameplate

2.2. Type description of inverter

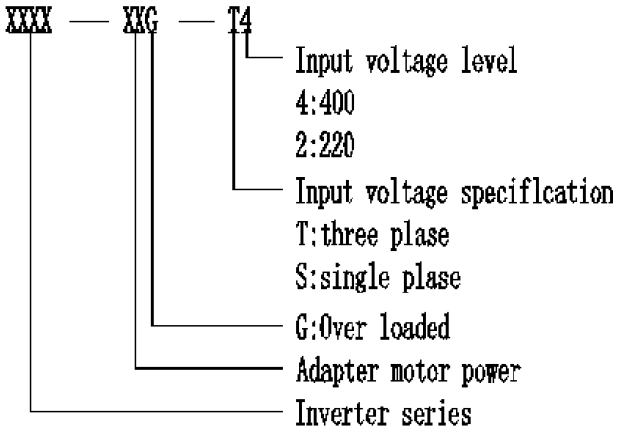


Figure 2.2 Type description of frequency inverter

2.3. Type of frequency inverter

Table 2.1 Type of QD200 series frequency inverters（Single-phase 200V class）

Type	Motor power		line current (A)	output current (A)	Maximum transient current for 60s (A)
	kW	HP			
QD200-0R4G-S2	0.37	0.5	5.9	2.4	3.6
QD200-0R75G- S2	0.75	1	10.2	4.2	6.3
QD200-1R5G- S2	1.5	2	17.7	7.5	11.3
QD200-2R2G- S2	2.2	3	23.9	10	15

Table 2.2 Type of QD200 series frequency inverters（Three-phase 400V class）

Type	G type (overloaded)			
	Motor power (kW)	Line current (A)	Rated output current (A)	Maximum transient current for 60s (A)
QD200-0R75G-T4	0.75	3.6	2.3	3.5
QD200-1R5G-T4	1.5	6.4	4.1	6.2
QD200-2R2G-T4	2.2	8.7	5.5	8.3
QD200-4RG-T4	4	14	9.4	14.1
QD200-5R5G-T4	5.5	20.7	12.6	18.9
QD200-7R5G-T4	7.5	26.5	17	25.5
QD200-11RG-T4	11	36.6	24.6	37
QD200-15RG-T4	15	40	32	48
QD200-18R5G-T4	18.5	47	38	57
QD200-22RG-T4	22	56	45	68
QD200-30RG-T4	30	70	60	90
QD200-37RG-T4	37	80	75	113
QD200-45RG-T4	45	94	92	138
QD200-55RG-T4	55	128	115	173
QD200-75RG-T4	75	160	150	225
QD200-90RG-T4	90	190	180	270
QD200-110RG-T4	110	225	215	323
QD200-132RG-T4	132	265	260	390
QD200-160RG-T4	160	310	305	458
QD200-185RG-T4	185	355	350	525
QD200-200RG-T4	200	385	380	570
QD200-220RG-T4	220	430	425	638
QD200-250RGP-T4	250	485	480	720
QD200-280RG-T4	280	545	530	795
QD200-315RG-T4	315	610	600	900
QD200-350RG-T4	350	665	650	975
QD200-400RG-T4	400	785	725	1088
QD200-500RG-T4	500	885	860	1290

2.4. Technical specifications

Table 2.3: Technical Parameters of QD200 Series Frequency Inverters

ITEM		SPECIFICATIONS
Main Input	Rated voltage and frequency	Single-phase 200V class: 200V-240V,50Hz/60Hz
		3-phase 400V class: 380V-480V , 50Hz/60Hz
	Allowable value of change	Voltage: 380V-15% ~ 480V+10%; Frequency: ±15%
Main output	Output voltage	Maximum output voltage equals to input voltage
	Output frequency	0.5 Hz to 400 Hz
	Overload capacity	150% of rated output current for 60s, 200% of rated output current for 2s
Control performance	Modulation mode	3-phase PWM, 2-phase PWM
	Control mode	V/f control for constant torque, V/f control for quadratic load, vector control without PG (open loop control),Energy-saving
	Setting method of run command	Outer terminal, keyboard panel or serial communication
	Setting method of speed command	Analog setting, keyboard, serial communication, UP/DOWN speed setting from external terminal
	Speed setting resolution	Keyboard: 0.1 Hz
		Analog setting: 0.05/50Hz (10bit)
	Speed control precision	V/f control:±2%
		vector control without PG (open loop control): ±0.2%
	Speed control range	V/f control 1:40
		vector control without PG (open loop control) 1:200
	Acceleration and Deceleration Time	0-3200.0s
	switching frequency	1.5 kHz ~ 12 kHz, according to junction temperature automatically reduce the switching frequency
Analog input	Number	2 ways: AI1、AI2
	Type	DC voltage or DC current
	Maximum input range	AI1: 0 to 5VDC, 0 to 10VDC, 0/4 to 20mA DC receivable AI2: 0 to 10VDC or PTC probe input receivable
Analog output	Number	1 way: AO1
	Type	DC voltage or DC current
	Maximum input range	Voltage output: 0 to 10V, Current output: 0/4 to 20mA
logic input	Number	0.75kw-11kW:LI1,LI2,LI3,LI4,AI1,AI2 15kW-500kW:LI,LI2,LI3,LI4,LI5,LI6,LI7,LI8,AI1,AI2 note:2 virtual logic input, capable of configuring AI1 and AI2 into logic input port (positive logic or negative logic)
	Type	Source or Sink
	Maximum input range	0-24VDC

ITEM		SPECIFICATIONS
logic output	Number	0.75kW-11kW: pulse signal output （LO-CLO） 、 relay output 1（T1A、T1B、T1C） 15kW-500kW:pulse signal output（LO-CLO）、relay output 1、2（T1A-T1B-T1C、T2A-T2B-T2C）
	pulse signal output	OC,output frequency、current output、ect other function
	relay output	RA-RB-RC, including a NO contact and a NC contact Maximum switch capacity: T1A,T1B: 3A at 250VAC, or 4A at 30VDC T2A,T2B: 2A at 250VAC or 30VDC
Serial communication interface		RS485 interface supports Modbus protocol.
Display	4-digit LED digital display	For display of frequency setting, output frequency, fault code and parameter setting etc.
Environment	Standard	Development of QD200 series frequency inverters follows strict international standards and relevant recommended IEC and EN standards for control devices, especially IEC/EN61800-5-1 and IEC/EN61800-3.
	Altitude	Derating unnecessary when altitude is 1000m or below (Derating necessary at altitude higher than 1000m)
	Ambient environment	0.75kW-11kW: Reliable operation at -10 ~ 50°C without derating. When top protective cover is taken off, the environment temperature can be as high as +50 °C. Above +50 °C, the current drops by 2.2% for each rise of 1 °C in temperature. 15kW-500kW: Reliable operation at -10 ~ 40°C without derating. Storage: -25 ~ 70°C
	Humidity	No condensed water or drip at 5 ~ 95%, In accordance with IEC60068-2-3
	Impact strength	15gn for continuous 11ms, In accordance with IEC/EN60068-2-27
	Maximum antipollution capacity	Class 2, in accordance with IEC/EN61800-5-1
Structure	Protection level	Top: IP41 (without removing the protective top cover). Other parts: IP20
	Cooling Method	Forced Air cooling
Installation method		Wall mounted

2.5. External dimensions and other parameters

Description of components in the frequency inverter

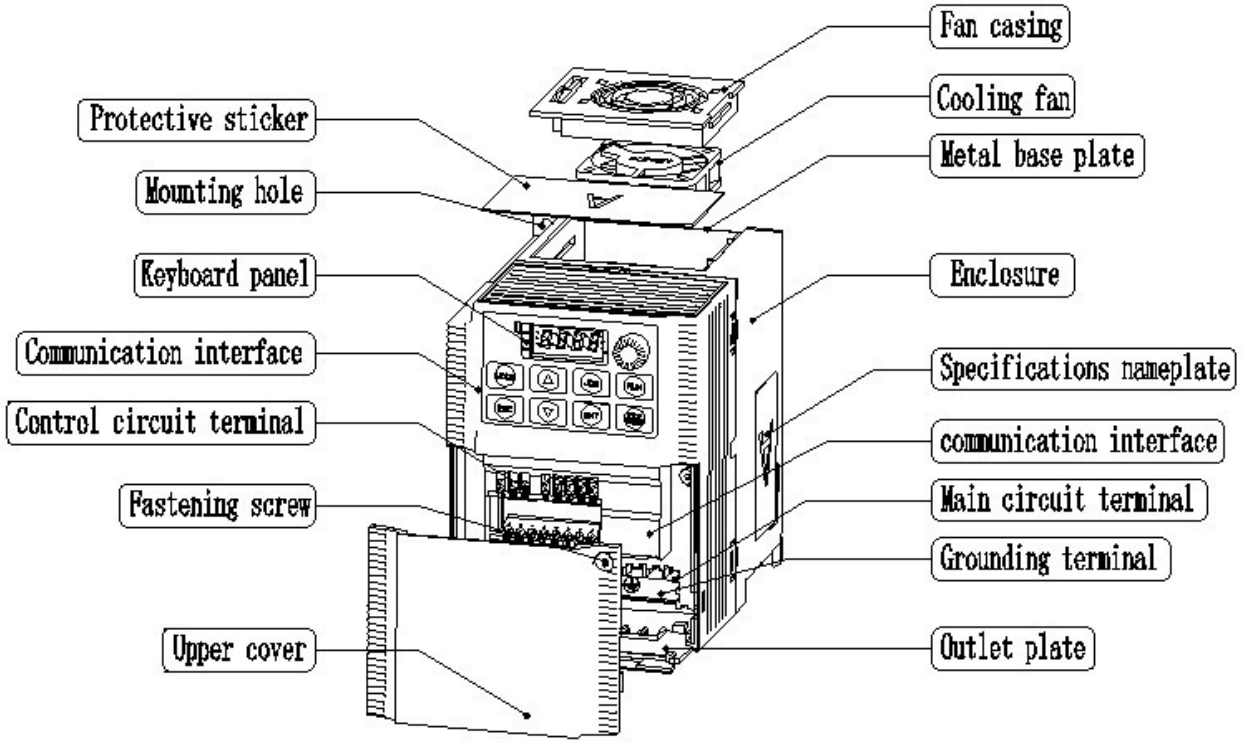


Figure 2.3 Components of the frequency inverter（three-phase11kW and below)）

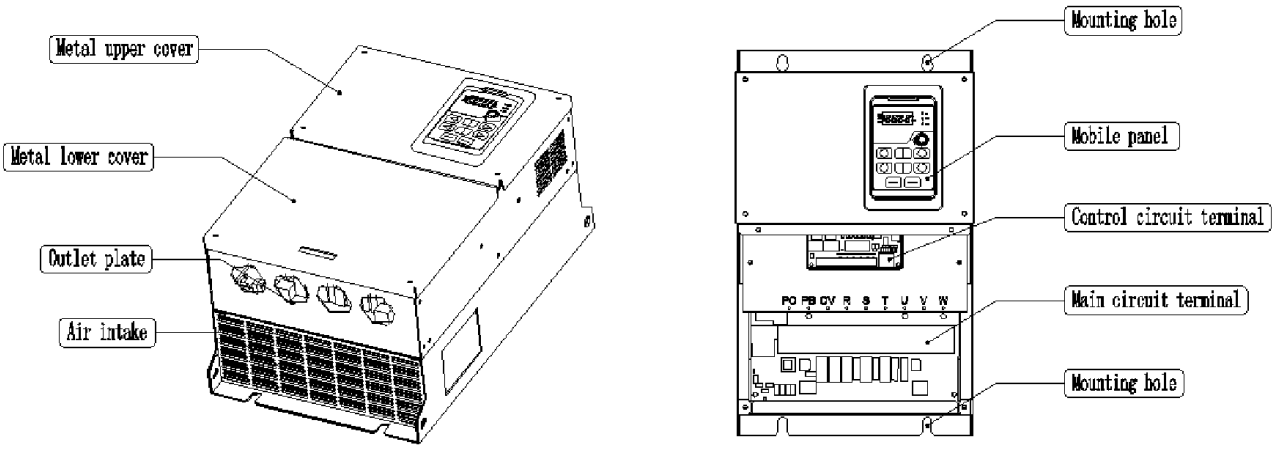


Figure 2.4 Components of the frequency inverter （three-phase 15kW and above)

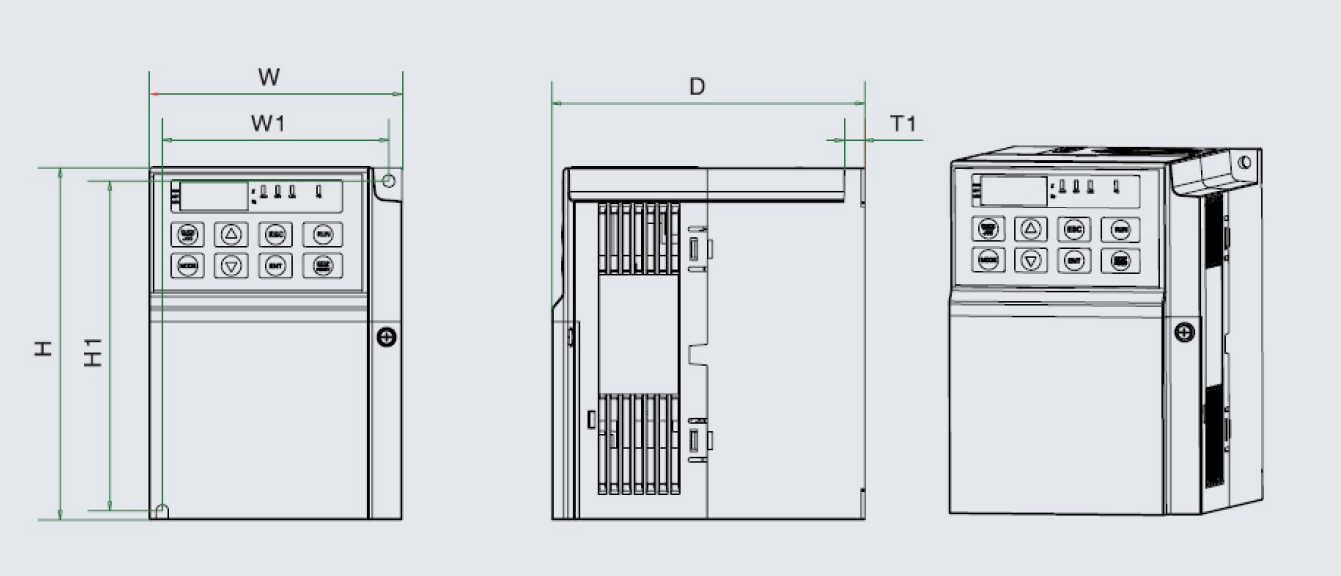


Figure 2.5 External and mounting dimensions(Singal phase, three-phase11kW and below)

Table 2.4 External and mounting dimensions(Singal phase, three-phase11kW and below)

Motor power		Frequency inverter type	External and mounting dimensions (mm)				
kW	HP		W	H	D	H1	W1
0.37	0.5	QD200-0R4G-S2	145	107	144	135	95
0.75	1	QD200-0R75G-S2					
0.37	0.5	QD200-0R4G-T4					
0.75	1	QD200-0R75G-T4					
1.5	2	QD200-1R5G-T4					
2.2	3	QD200-2R2G-T4					
1.5	2	QD200-1R5G-S2	200	138	134	188	124
2.2	3	QD200-2R2G-S2					
4	5.5	QD200-4RG-T4					
5.5	7.5	QD200-5R5G-T4					
7.5	10	QD200-7R5G-T4	232	153	164	220	139
11	15	QD200-11RG-T4					

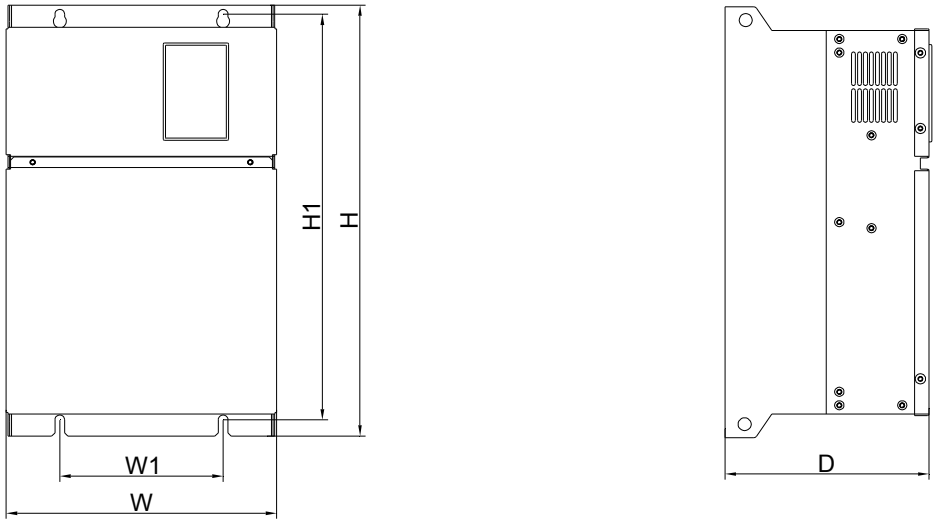


Figure 2.6 External and mounting dimensions (three-phase 15kW and above)

Table 2.5 External and mounting dimensions (three-phase 15kW and above)

Motor power		Frequency inverter type	External and mounting dimensions (mm)				
kW	HP		W	H	D	H1	W1
15	20	QD200-15RG-T4	399	249	188	176	150
18.5	25	QD200-18R5G-T4					
22	30	QD200-22RG-T4	449	277	212	426	170
30	40	QD200-30RG-T4					
37	50	QD200-37RG-T4	580	318	268	557	180
45	60	QD200-45RG-T4					
55	75	QD200-55RG-T4					
75	100	QD200-75RG-T4	700	378	295	676	180
90	125	QD200-90RG-T4					
110	150	QD200-110RG-T4					
132	175	QD200-132RG-T4	1060	580	390	997	350
160	215	QD200-160RG-T4					
185	250	QD200-185RG-T4					
200	270	QD200-200RG-T4					
220	300	QD200-220RG-T4	1150	820	390	1087	350
250	340	QD200-250RG-T4					
280	375	QD200-280RG-T4					
315	425	QD200-315RG-T4					
355	475	QD200-350RG-T4	1955	1200	502		
400	536	QD200-400RG-T4					
500	670	QD200-500RG-T4					

2.6. DAILY INSPECTION AND MAINTENANCE

Electronic equipment can not be used permanently. Even in the normal working environment, characteristic change or abnormal action will occur if it exceeds service life. In order to prevent the fault problem and safety problem resulted from component aging due to environmental factors, such as temperature, oil mist, dust, vibration and moisture etc, it is necessary to carry out such preventive maintenance as daily inspection, periodic check and component replacement etc.

The inverter consists of IGBT, IC and other semiconductor components, capacitor, resistor and other electronic components, plus fan, relay and many other components. If all of these components can not work properly, it is impossible to bring the functions of the product into full play.

Note: Only qualified electric professional personnel can perform installation, wiring, disassembly and maintenance.

DANGER

- Designated personnel should mantain according to specified method.
- Before starting inspection and maintenance of the inverter, switch off power supply of all devices, and begin to maintain after waiting 10 minitures.
- Except designated personnel, no other person can perform maintenance, inspection or component replacement. Otherwise there is risk of electric shock.
- Perform all plug devices only when the power supply is completely switched off. Otherwise there is risk of electric shock.
- Take off watch, ring or other metal articles before performing check, maintenance, and component replacement etc. Try not to wear loose clothing, but to wear eye protection glasses.
- Only designated personnel familiar with installation, commissioning and repair can perform installation, wiring, repair, check and component replacement.

CAUTION

- Please fasten the terminal screw with specified torque. If the connection of the main circuit wires becomes loose, fire may occur due to the overheat at the connection of the wire.
- Do not apply wrong voltage to the main circuit power supply. Otherwise there is risk of electric shock.
- Do not make combustible in close contact with the inverter or attach combustible to the inverter. Otherwise there is risk of fire. Please install the inverter on metal or other flame retardant objects.

2.6.1. Daily inspection

WARNING

- When using PCB, be sure to follow processes specified by the electrostatic protection measures (ESD). Otherwise internal circuit may be damaged due to static electricity.
- Please follow the instruction of this manual to corretly replace the cooling fan. If the installation direction is wrong, the cooling function can not be brought into play and it may result in damage of the inverter. When installing the cooling fan to the inverter, be sure to make the side with label upward.
- For the inverter with 2 cooling fans, be sure to replace them together in order to extend the service life of the product to the maximum extent.
- Never disassemble or install the motor when the inverter outputs voltage. Otherwise the inverter may be damaged.
- When wiring the control circuit, do not use cables other than shielded wire. Otherwise it may result in abnormal action of the inverter. Please use shielded and double-stranded wire and connect its shielded layer to the grounding terminal PE of the inverter.
- Nonprofessional shall not perform wiring in case damaging the inverter.
- Please do not attempt to change the circuit of the loop. Otherwise it may damage the inverter. The required repair herefrom does not belong to the guarantee scope of our company.
- Qirod bears no responsibility if Your company or the user of Your company makes reconstruction to the product.
- After the wiring of the inverter with other machine is finished, make sure that all wiring is correctly performed. Otherwise it may damage the inverter.
- Please make the wiring according to correct phase sequence. Inconsistency of the phase sequence may result in reverse rotation of the motor.
- Connect the output terminals U, V and W of the inverter to the input terminals U, V and W of the motor respectively. At this time make sure that the phase sequencies of the motor terminals and inverter teminals are in consistency.
- In consideration of the service life of internal relay contact and the electrolytic capacitor, make sure that the maximum frequency for powering on and off does not exceed once every 30 minutes.
- Try best to perform running and stop of the motor according to the running/stop operation of the inverter.
- Do not try to operate damaged machine in case of acceleration of the damage. If the inverter has obvious damge or some component is lost, do not connect it or operate it.

2.6.1.1. Routine inspection

Content of routine inspection:

- Whether screws of the control terminals are loose. Use screwdriver of proper size to fasten them.
- Whether there is poor contact at the main circuit terminals, and whether there is overheat trace at connection of cables or the copper bar and at the screws.
- Whether there is damage on the power cables and the control cables, especially if there is trace of crack and cut on the external insulation layers.
- Whether the joint of power cable and cold-compression terminals is loose, and whether the insulation binder (tape) at the joint is aging or falling.
- Thoroughly clean the dust at the PCBs and the wind duct. Make sure to take antistatic measures when perform cleaning.
- Before conducting insulation test to the inverter, be sure to firstly disassemble all connection wires between the inverter and the power supply and between the inverter and the motor, reliably short connect all input and

output terminals of main circuit with conducting wire, then conduct earth test.

- Use qualified 500 V megger (or corresponding voltage shift position of insulation test instrument) to perform insulation test. Do not use faulty instrument; It is strictly prohibited to perform earth insulation test by connecting only one single main circuit terminal, otherwise there is risk of damaging the inverter.
- Never perform insulation test to control terminals. Otherwise it may damage the inverter. After the test BE SURE TO disassemble all the conducting wires that short connect all main circuit terminals.
- Before conducting insulation test to the motor, be sure to disconnect all conducting wires between the motor and the inverter, then individually perform test to the motor. Otherwise there is risk of damaging the inverter.

2.6.2. Daily inspection

The routine inspection items of Qirod's inverter are shown in table 2.6. To avoid deterioration of the inverter's function and damage to the product, please make the confirmation of the following items every day.

Table 2.6 Table of items of daily inspection

Inspection object	Main points of inspection			Judgement standard
	Content of inspection	Period	Inspection means	
Operation environment	Temperature and humidity	Any time	Point thermometer and hygrometer	The environment temperature is lower than 55°C. Otherwise the inverter should be derated. Humidity complies with requirement of the environment.
	Dust, vapor and dripping leak		Observation	No dust, trace of water leakage or dewdrop
	Gas		Observation and sniffing	No abnormal color or smell
Inverter	vibration	Any time	Synthetical observation	Smooth operation without vibration
	Heat radiation and heat generation		Point thermometer and synthetical observation	Fan operates normally with nomal wind speed and air volume, and without abnormal heat generation.
	Noise		Listening	No abnormal noise
Motor	Vibration	Any time	Synthetical observation and listening	No abnormal vibration and noise
	Heat generation		Point thermometer	No abnormal heat generation
	Noise		Listening	No abnormal noise

Inspection object	Main points of inspection			Judgement standard
	Content of inspection	Period	Inspection means	
Running status parameter	Power supply input voltage	Any time	Voltmeter	In accordance with requirement of the specifications
	Inverter output voltage		Rectifier type voltmeter	In accordance with requirement of the specifications
	Inverter output current		Amperemeter	In accordance with requirement of the specifications
	Internal temperature		Point themometer	Temperature rise < 40°C

2.6.3. Periodic instection

The periodic inspection items of Qirod's inverter are shown in table 2.7. Normally it is better to make a periodic inspection every 3 or 6 months. In practice, please determine actual inspection frequency in combination with application condition of the inverter and working environment. Periodic inspecition helps to prevent deterioration of performance and damange of the product.

Table 2.7 Table of items of periodic inspection

Inspection items	Content of inspection	Measures to fault
Main circuit		
Whole body	Make inspection with megameter (between the main circuit terminals and the grounding terminals).	Take proper measures (fastening etc)
	Whether there is component decolored due to overheat or aging.	Replace the damaged component.
	Whether there is damage or deformation to component	If there is damaged place impossible to be repaired or replaced, replace the whole inverter.
	Whether there is dirt, rubbish or dust.	Confirm the door of the control cabinet containg the inverter is firmly closed. If it is difficult to make cleaning, please replace the seriously dirtied part.
		Clean with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)
Conductor and wire	Whether wires and connection are decolored, damaged, or aged due to overheat.	Replace damaged wire.
	Whether there is breakage, crack or decoloring on the wire sheath.	

Inspection items	Content of inspection	Measures to fault
Terminal block	Whether there is fray, damage or loosening in the connecting terminals.	If screw or terminal is damaged when fastened, replace it.
Electromagnetic contactor and relay	Whether there is abnomal noise when it works.	Confirm the coil voltage repectively under two situations: the voltage exceeds or does not exceed the reference value.
	Whether there is aging or crack on the wire sheath of the coil due to overheat.	Replace damaged electromagnetic contactor, relay or PCB.
Braking resistor (optional)	Whether the insulator is decolored due to overheat.	Slight decoloring is not abnormal.
		When decoloring is detected, confirm whether there is bad wiring.
Electrolytic capacitor	Whether there is liquid leak, decoloring or crack.	If there is damaged place impossible to be repaired or replaced, replace the whole inverter.
	Whether the safety valve is exposed and whether the capacitor swells or cracks, or there is liquid leak.	
Diode and IGBT	Whether there is rubbish or dust.	Clean with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)
Motor		
Action inspection	Whether vibration and operation noise is acutely abnormal.	Stop the motor and contact specialized service personnel.
Control circuit		
Whole body	Whether there is fray, damage or improper connection at the connecting terminals.	If screw or terminal is damaged when fastened, replace it.
	Whether the screw is loose.	If it is impossible to repair or replace the terminals of the PCB, replace the inverter.
PCB	Whether there is abnormal smell, decoloring, severe rust, whether the connectors are correctly installed and whether there is dust and oil mist.	Re-install connectors.
		If the PCB can not be cleaned with anti-static cloth or dust cleaner, replace it.
		Do not apply solvent to the PCB.
		Clean rubbish and dust with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)
		If there is damaged place impossible to be repaired or replaced, replace the whole inverter.

Inspection items	Content of inspection	Measures to fault
Cooling system		
Coolling fan	Whether there is abnormal noise and vibration in the motor of the cooling fan.	Sweep or replace the cooling fan.
	Whether there is damaged or missing blade.	
Cooling fin	Whether there is rubbish and dust or dirt.	Clean rubbish and dust with dry air. (Pressure: 39.2×10^4 ~ 58.8×10^4 Pa)
Ventilation vent	Whether air inlet and outlet are blocked or there is foreign body attached.	Clear obstacle and dust.
Indicator		
Keyboard panel	Whether LED indication is correct.	If there is bad situation in LED or the operation keys, contact Qirod's distributors or sales offices.
	Whether the operation part is polluted.	Clean it.

2.6.4. Maintenance

2.6.4.1. Standard for replacement of component

To ensure reliable running of the inverter, besides periodic maintenance, replace the following internal components peoriodically: components withstanding long-term mechanical wear, all cooling fans and main circuit filter capacitor used for energy storage and exchange. For normal continuous application, make the replacement according to the following table. Please also consider the concrete situation such as application environment, load situation and inverter status etc.

Table 2.8 Service life reference of main components of the inverter

Name of component	Service time
Fan	30,000~40,000 hours
Electrolytic capacitor	40,000~50,000 hours
Relays RA-RB-RC	Approx. 100,000 times

2.6.4.2. Storage and safekeeping

After purchase of the inverter if it is not put into use immediately and has to be kept for a short time or stored for a long time, follow the following instructions:

- Store the inverter at places with temperature range specified by the standard, with no moisture, dust and metal powder but with good ventilation.
- If the inverter has not been used more than 1 year, perform charging experiment to it so as to restore the characteristics of main circuit filter capacitor inside the inverter. During charging, slowly raise the input voltage with a voltage regulator until to the rated input voltage. The switching on time should be more than 1-2 hours.

The above experiment should be done at least one time a year.

- Do not perform voltage withstanding test at will. Otherwise it will reduce the service time of the inverter. For the insulation test, it is suggested to make measurement with 500 V megameter before the test. The insulation resistance should not be lower than 4MΩ.

Table 2.9 Storage environment

Environment characteristics	**Requirement**	**Note**	
Ambient temperature	-25°C ~+70°C	The temperature is < 30°C for long time storage in case of deterioration of the capacitor.	Avoid dewing and freezing environment resulted from drastic change of temperature.
Relative humidity	5~95% without condensation or dripping water	Adopt plastic film for sealing and desiccant etc.	
Storage environment	There is no direct sunshine, dust, corrosive gas, flammable gas, oil, vapor, gas, dripping water and vibration, and there is less salt.		

2.6.4.3. Measurement and judgement

When using ordinary current clamp meter to measure current, there is imbalance of current at the input side. Discrepancy within 50% is normal. If the discrepancy is 70%, notify the manufacturer for replacing the rectifier bridge, or check if the descripancy of 3-phase voltage exceeds 5 V.

Normally avometer is used to measure 3-phase voltage. Due to the interference of carrier frequency, the readings are not accurate and can be used only for reference. The output voltage should not be higher than the valid value of voltage at the input side. If the voltage exceeds the value, it shows that the avometer is interfered and the output is not abnormal.

3. INSTALLATION AND WIRING

3.1. Installation of inverter

DANGER

- Please install the inverter on metal or other incombustible. Otherwise there is danger of fire.
- Do not place combustible nearby in case of danger of fire.
- Do not install the inverter in the envioronment with explosive gas. Otherwise there is danger of explosion.

CAUTION

- Please hold the bottom of the inverter during transportation. Otherwise there is danger of personal injury or damage to the inverter if the main body falls.
- The load carrying capacity of the platform should be taken into consideration during installation. Otherwise there is danger of injury or damage to the inverter if the main body falls.
- Do not install the inverter in places where there is flash from a forcet. Otherwise there is danger of damage to the inverter.
- Do not allow foreign body, such as screw, washer or metal rod to fall inside the inverter. Otherwise there is risk of fire and damage of the inverter.

3.2. Installation Envioronment

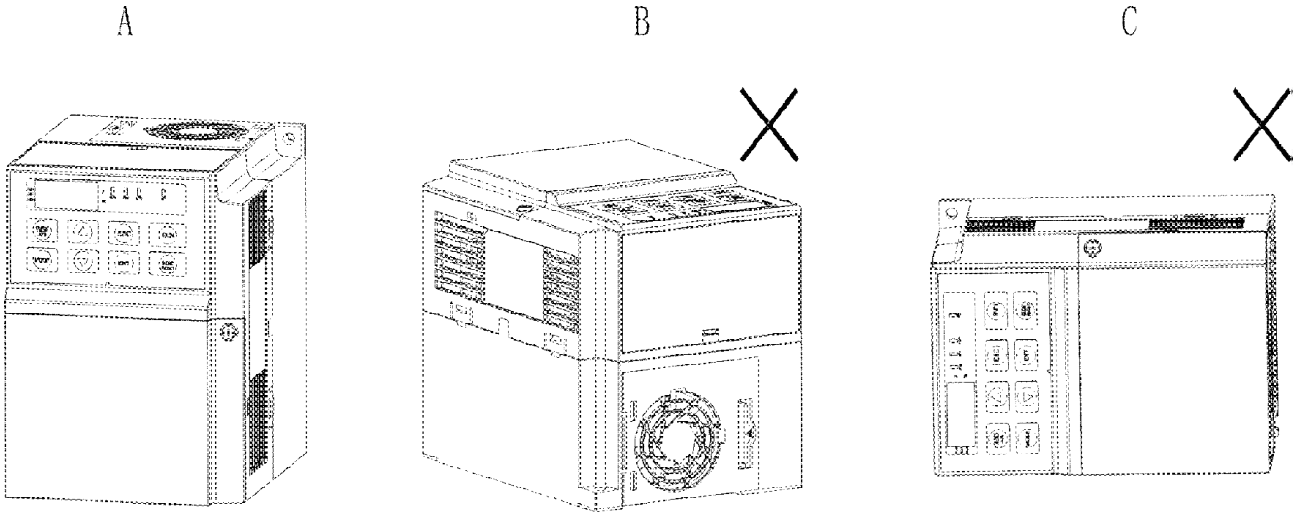
The installation environment is very important for bringing the performance of the inverters into full play and maintaining its functions for a long time. Pleaase install the inverter in the environment shown in the following table.

Table 3.1 Installation environment of the inverter

ENVIRONMENT	CONDITION
Installaiton site	Indoors
Ambient temperature	-11kW and below: -10°C ~ +50°C 15kW and above: -10°C ~ +40°C • To raise the reliability of the machine, please use the inveter at the place where there is no drastic change of temperature. • When the inveter is employed in such enclosed space as control cabinet etc, please use fan or air conditioner for cooling in case the inside temperature surpasses the ambient temperature. • Avoid freezing in the inveter.
Humidity	Below 95%RH Avoid dew in the inverter
Storage temperature	-25°C ~ +70°C
Environment	The inverter should be mounted at the following sites, where: • There is no oil mist, corrosive gas, flammable gas or dust; • It is not easy for metal powder, oil, water or other foreign substance to get inside the inverter (DO NOT mount the inverter on wood or other flammable body); • There is no redioactive material and flammable object; There is no harmful gas and liquid; • There is little salt corrosion; • There is no direct exposure to sunshine.
Altitude	1000m or below
Vibration resistance	≤5.9m/s²
Installation direction	BE SURE TO install the inverter in vertical direction so as not to reduce the cooling effect of the inverter.

3.2.1. Instruction of inverter installaiton position

BE SURE TO install the inverter in vertical direction as shown in the following Figure 3.1 so as not to reduce the cooling effect of the inverter.



A — Vertical installation
Correct installation

B — Horizontal installation
Wrong installation

C — Transverse installation
Wrong installation

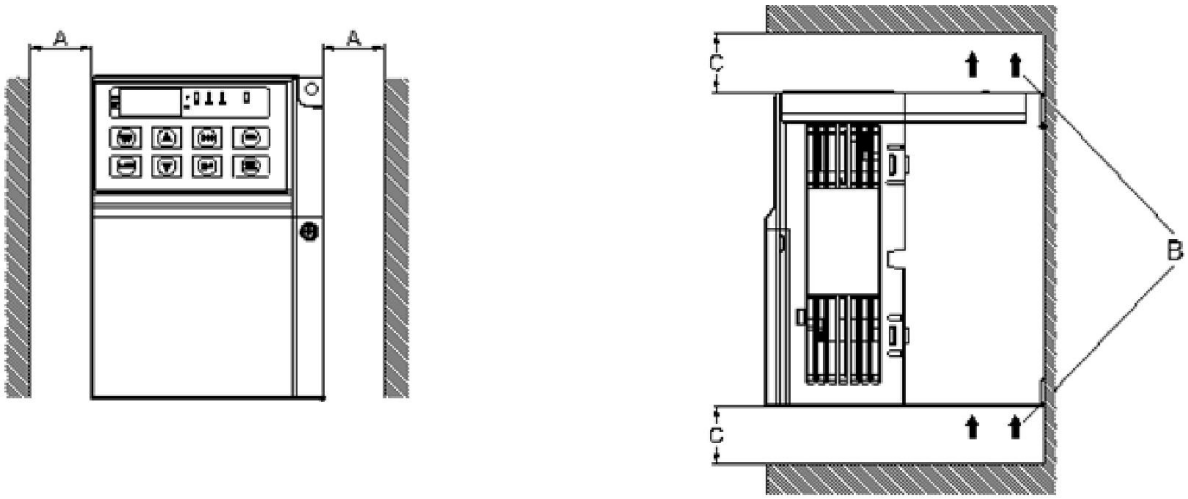
Figure 3.1 Inverter installation direction

When installing an individual inverter, be sure to follow the installation instruction shown in Figure 3.2 in order to insure ventication and wiring space necessary for the inverter. Please keep the back of the inverter close to the wall and mount the inverter. In this way the cooling air around the radiation fins moves freely to ensure cooling effect.

Installation space of the frequency inverter (individual inverter)

Horizontal (left to right) space

Vertical (up to down) space



A — Distance over 30mm B — Ventilation direction C — Distance over 100mm

Figure 3.2 Installation interval and distance for individual frequency inverter

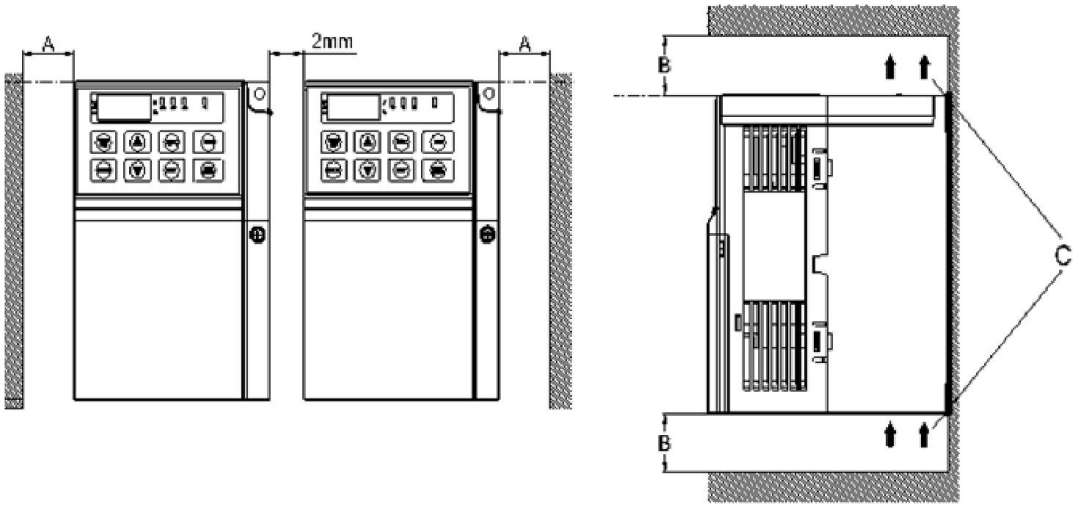
For installation of more than one frequency inverter inside the control cabinet, side-by-side installation is normally adopted. The cabinet is equipped with air inliet, air outlet and special cooling fan. See Figure 3.3.

For vertical installation, airflow guidance separators should be installed among the inverters to achieve better heat dissipation effect.

Installation space of the frequency inverter (side-by-side)

Horizontal (left to right) space

Vertical (up to down) space



A — Distance over 30mm B — Distance over 100mm C — Ventilation direction

Figure 3.3 Installation interval and distance of multiple frequency inverters

3.2.2. Installation method of inverter

- Refer to Figure 3.4 for confirmation of mounting holes on the inverter.
- Fix the upper screws of the inverters. Take care not to fasten them firmly, but to leave a space of several millimeters for the convenience of fixing the lower screws.
- Fix the lower screws and secure all the screws.

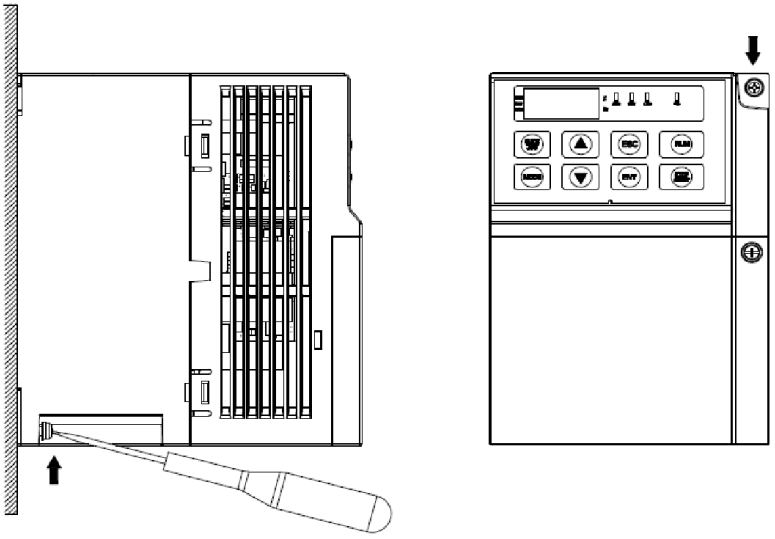
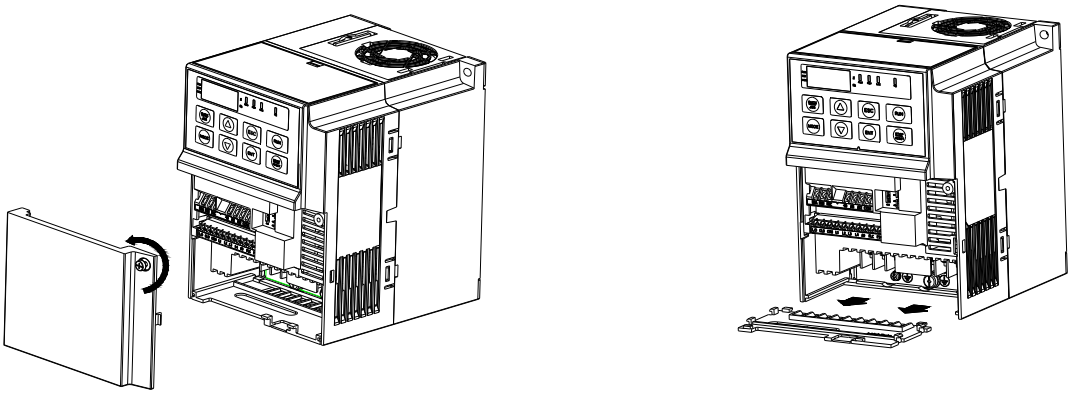


Figure 3.4 Installation method of inverter

3.2.3. Disassembly/installation of the cover

Disassembly of the inverter cover: Loosen screws of the cover to disassemble it. Take off the outlet board and install the input power supply and motor wire bundle as showen in Figure 3.5.



a) Disassembly of the cover b) Disassembly of the outlet board

Figure 3.5 Disassembly of the inverter cover

Installation of the inverter cover: After finishing the wiring and confirming correct connection of all wires, put the outlet board back to its original position, close the cover and fasten the screws.

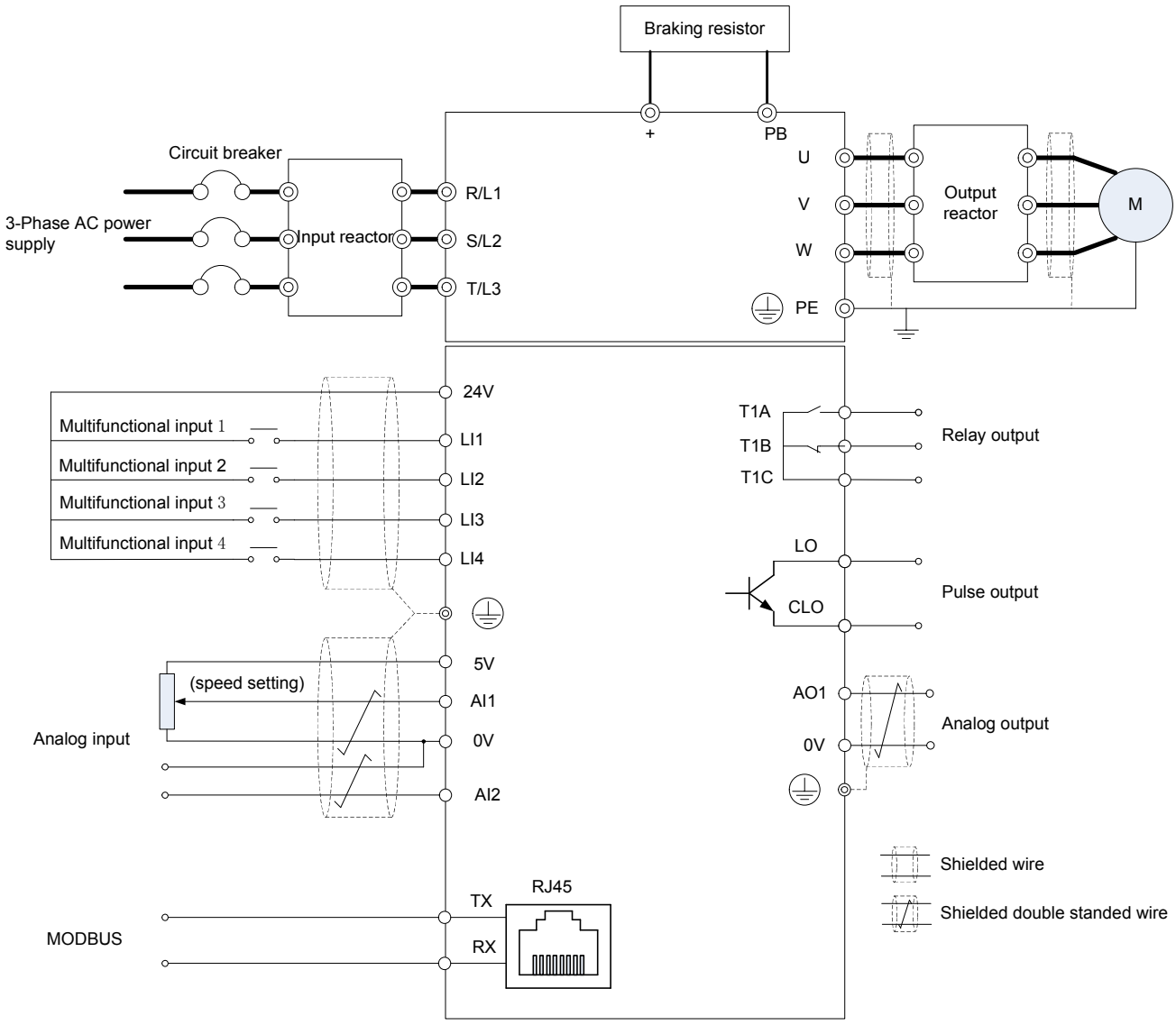
3.3. Wiring of the inverter

WARNING
• Before wiring the inverter, please confirm that input power supply is completely disconnected. Otherwise there is risk of electric shock. • Only professional engineering personnel can perform the wiring in case of the risk of electric shock. • The earthing terminal PE must be properly grounded in case of the risk of electric shock. • Do not touch directly the wiring terminals with hand and never allow the output wire to contact the enclosure of the inverter. Otherwise there is risk of electric shock. • Do not connect power supply to the output terminals U, V and W in case of damage to the inverter.

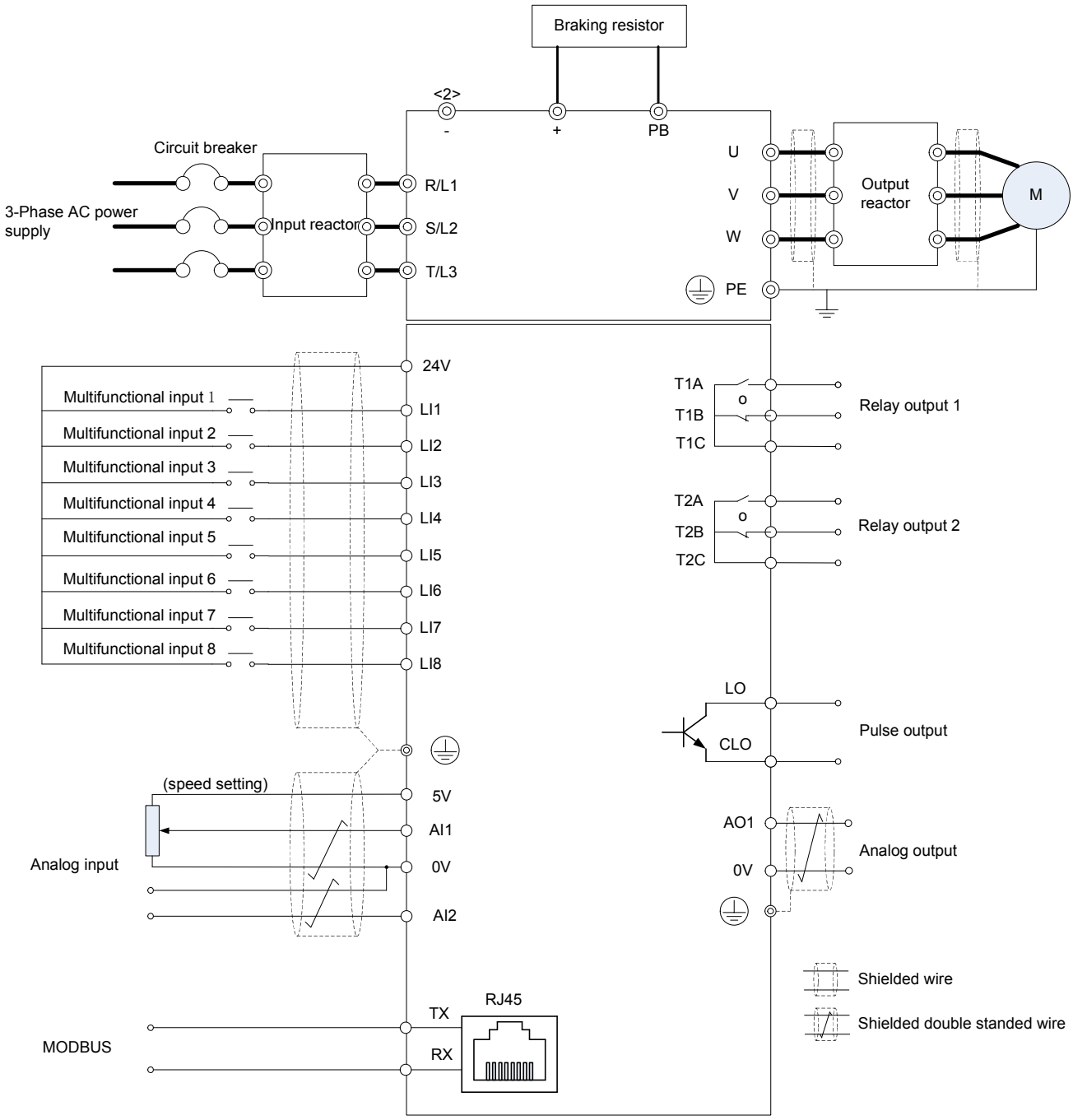
CAUTION
• Please confirm the voltage of the AC main circuit power suppy is in comformity with the rated voltage of the inverter. Otherwise there is risk of fire and personal injury. • Please correctly connect the braking resistances according to the diagram. Otherwise there is risk of fire.

3.3.1. Basic operation wiring diagram

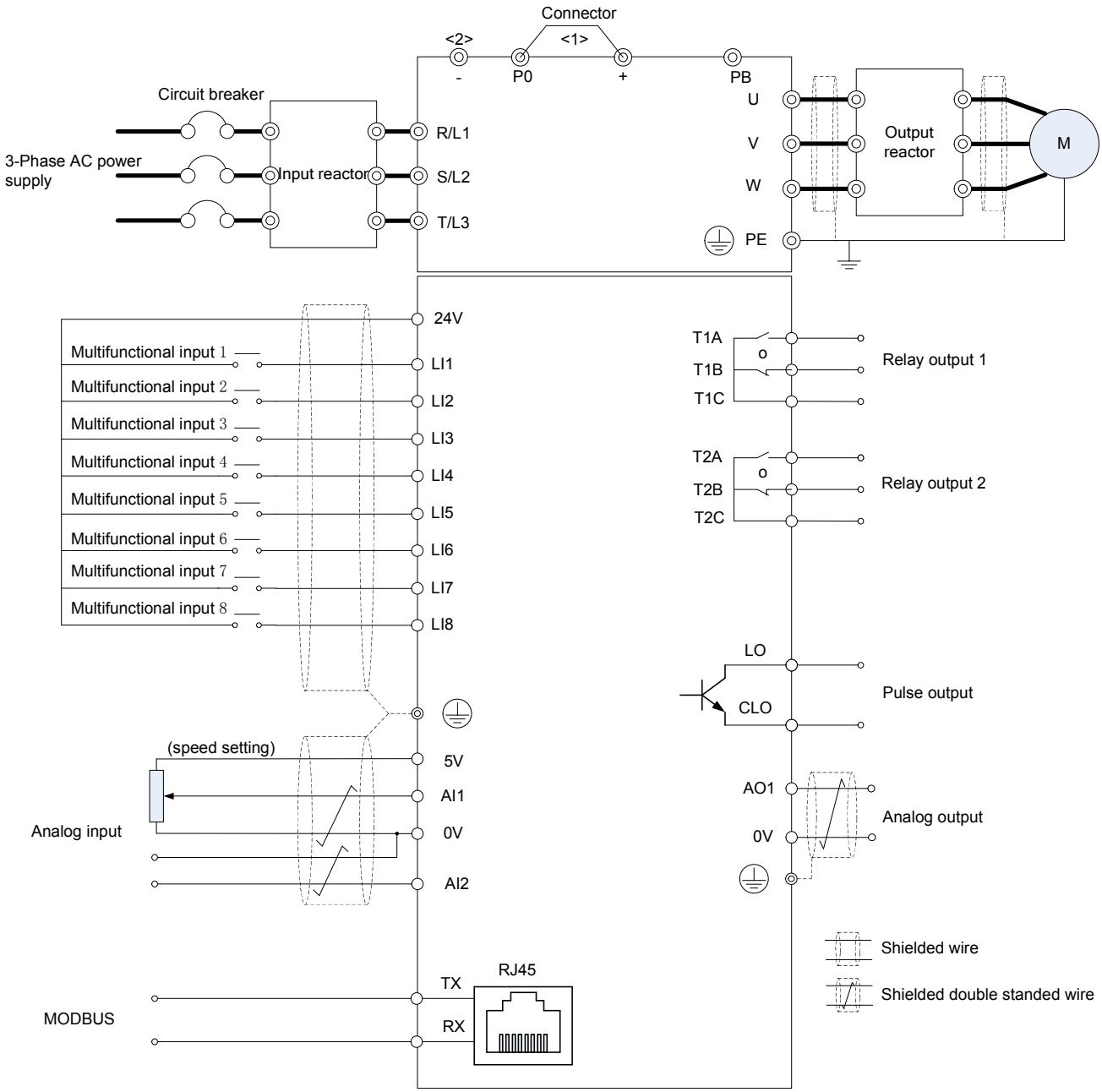
Please refer to Figure 3.6 for wiring of the inverter. Make only wiring of the main circuit to start the motor when the frequency inverter is operated with keyboard panel.



(a) Basic wiring diagram of 11kW and below



(b) Basic wiring diagram of 15kW and 18.5kW



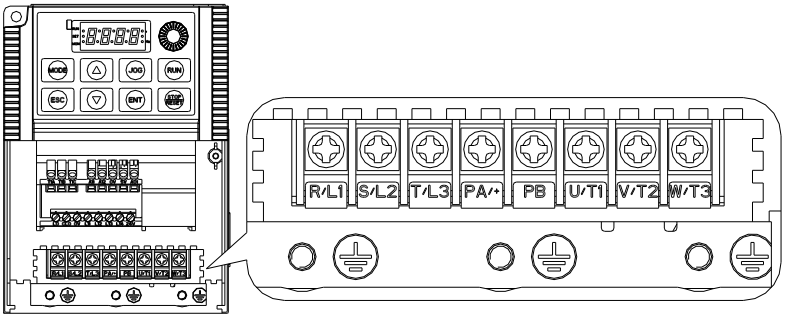
(c) Basic wiring diagram of 22kW and above

Figure 3.6 Basic wiring diagram of the inverter

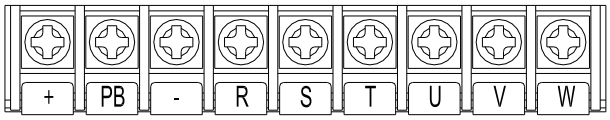
1. Input voltage signal or current signal can be selected with AI1. The type of input signal can be set by the dial switch S3 on the control board.
2. Correct connection must be followed when external braking resistor is required.
3. In the diagram, "◎" means main circuit terminal, and "○" means control terminal.

3.3.2. Wiring of the main circuit

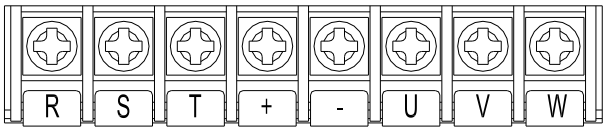
The arrangement of the main circuit terminals is shown in Figure 3.7.



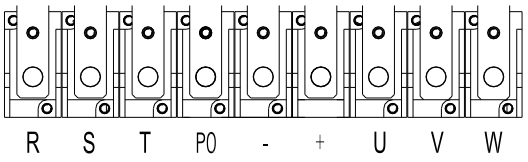
(a) the main circuit terminals(11kW and below)



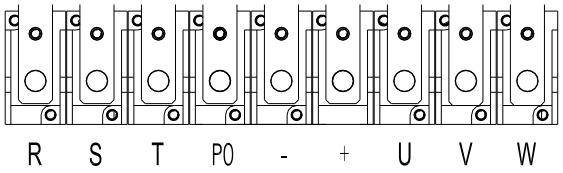
(b) the main circuit terminals(15kW and 18.5kW)



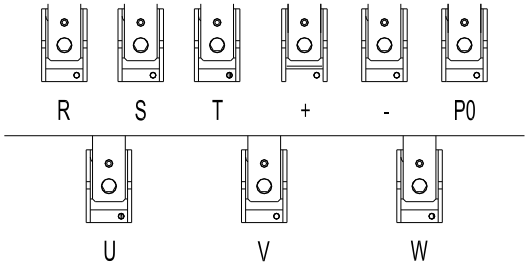
(c) the main circuit terminals(20kW and 30kW)



(d) the main circuit terminals(37-55kW)



(e) the main circuit terminals(75-110kW)



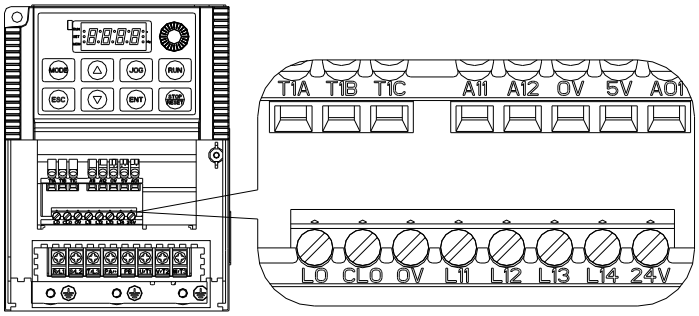
(f) the main circuit terminals(132-500kW)

Figure 3.7 Diagram of the main circuit terminals of the inverter

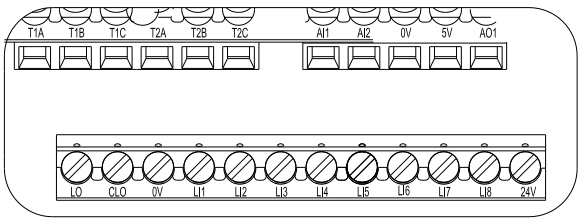
Table 3.2 Description of main circuit terminals

Code of terminal	Terminal	Function
R/L1	Power input for main circuit	3-phase, AC power input terminal, 380V, 50Hz/60Hz
S/L2		
T/L3		
U	Output of frequency inverter	Terminal for connection to motor
V		
W		
+、-	DC bus terminal	DC bus terminal, connect to braking unit etc "+" is the positive terminal of DC bus, "-" is the negative terminal
PA/+	Connection of braking resistor	Terminal for connection to braking resistor
PB		
PA/+、+	DC power input	PA (+) is the positive terminal of DC power input, PC is the negative terminal
⏚	Grounding	Terminal for grounding
		400V level: grounding resistance is 4Ω or below.

3.3.3. Wiring of the control circuit



(a) the control circuit terminals(11kW and below)

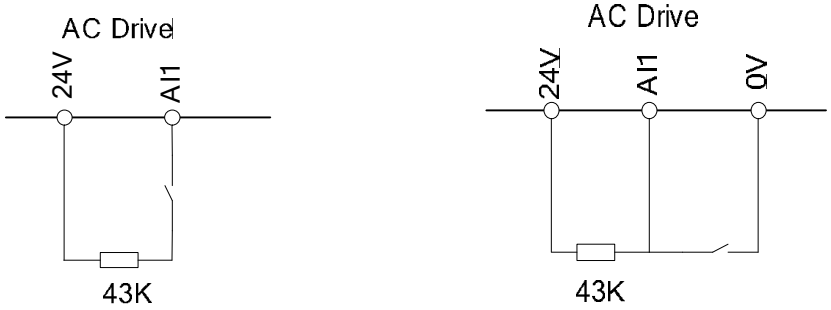


(b) the control circuit terminals(15kW and above)

Figure 3.8 Diagram of the control circuit terminals of the inverter

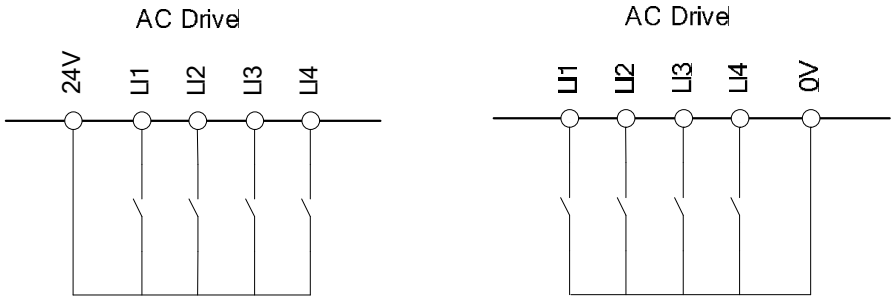
Table 3.3 Description of Control terminals function

Symbol	Item	Function
0V	public terminal of the control circuit	
5V	5V output voltage	Commonly used as working voltage of the external potentiometer Maximum current:10mA accuracy:±5%
24V	24V output voltage	Commonly used as working voltage of the logic input terminal Maximum current:100mA accuracy:±20%
AI1	Voltage/Current Analog input Or programmable logic input	Multifunction programmable analog input: accuracy:10 bit Analog voltage input:0 ~ +5 V or 0 ~ +10 V Analog current inputt:20 mA
		changing parameter setting, the AL1 can also be used as a programmable logic input terminal.If that, a resistor（43 kΩ）should be added between 24v-AL1; And move the VIA dip switch to the 10V position. Showed as Figure3.8
AI2	Voltage Analog input Or programmable logic input	Analog voltage input: accuracy:10 bit Maximum range: 0 ~ +10 V
		changing parameter setting, the AL2 can also be used as a programmable logic input terminal. If that, a resistor（43 kΩ）should be added between 24v-AL2 ; And move the VIA dip switch to the 10V position. connection method refers to AL1.
LI1～LI8	programmable logic input	+24 V Power supply
		Positive Logic(source):port voltage< 5 V, input invalid (OFF), port voltage > 11 V,input invalid (ON); Negitive Logic (sink): port voltage > 16 V,input invalid OFF, port voltage < 10 V,input invalid ON;
		Logic input connection diagram refers to Figure 3.9.
AO1	Voltage/Current Analog Output	Analog voltage output:0 ~ +10 V Analog voltage output:x ~ 20 mA
LO	Pulse output collector	Maximum current:100mA Maximum voltage:30V
CLO	Pulse output emitter	
T1A	Relay 1 Normally open(NO) contact	Largest switching capacity: T1A-T1C:5A @ 250VAC,5A @ 30VDC T1B-T1C:3A @ 250VAC,3A @ 30VDC
T1B	Relay 1 Normally closed (NC)contact	
T1C	Relay 1 Public contacts	
T2A	Relay 2 Normally open(NO) contact	Largest switching capacity: T2A-T2C:5A @ 250VAC,5A @ 30VDC T2B-T2C:3A @ 250VAC,3A @ 30VDC
T2B	Relay 2 Normally closed (NC)contact	
T2C	Relay 2 Public contacts	
T5	RS485 communication port	4nd feet is positive port of RS485 differential signa, 5nd feet is the negative port of RS difference signal.



(a) Positive Logic – source (b) Negitive Logic – sink

Figure 3.8 Wiring diagram when AI1is logic input terminal



(a) Positive Logic – source (b) Negitive Logic – sink

4. BASIC OPERATION AND TRIAL RUNNING

4.1. Appearance of Keyboard panel

User of this series frequency inverter can perform different operations through keyboard panel, including run/stop, display of different data, parameter value setting, fault display and reset etc. The following is description of the keyboard panel.

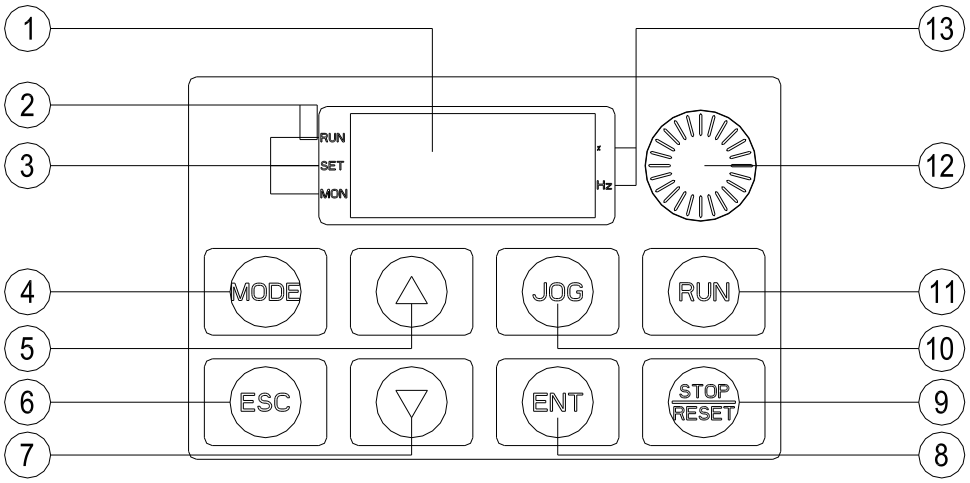


Figure 4.1 Each part of the keyboard panel

Table 4.1 Description and function of each part of the keyboard panel

No.	Item	Symbol	Function
1	Numeric display	—	To display frequency or parameter etc using LED.
2	Charging indication lamp	CHARGE	On – there is residual voltage in the inverter DC bus Off – there is no residual voltage in the inverter DC bus
3	Mode indication lamp	RUN	On – frequency inverter's operation demands and frequency instructions are all effective Flashing – frequency inverter's operation demands are effective, but frequency instructions are ineffective Off – there are no operation demands in frequency inverter
		SET	On – parameter setting mode Flashing – parameter setting mode, or shortcut menu. Off – parameter setting mode, or other modes except parameter verification mode
		MON	On – state monitoring mode Flashing – in the process of fault record retrieving Off – non state monitoring mode

4	MODE key	MODE	To select keyboard display mode or return to MODE from submenu
5	UP key	▲	To increase parameter number or parameter set value
6	ESCAPE key	ESC	To return to the previous state before the pressing of the ENT key
7	DOWN key	▼	To reduce parameter number or parameter set value
8	ENTER key	ENT	Press the key to display or confirm different modes, parameters or set values
9	STOP key	STOP	Press the key to stop the frequency inverter. The key becomes a RESET key when fault is discovered
10	JOG key	JOG	Press this key to enter into jog (inching) function under the invert's start model
11	RUN key	RUN	To run the inverter
12	Speed control knob	-------	To adjust speed
13	UNIT indication lamp	%	On – Unit of the displayed number is percentage
		Hz	On – unit of the displayed number is Hz

4.2. Basic operation of panel

4.2.1. Running model selection

QD200 inverter include four running models: Powering-on dafault mode, Parameter setting mode, Status monitoring mode and Parameter verifying mode. Any mode can be realized by the MODE Key, showed as Figure 4.2:

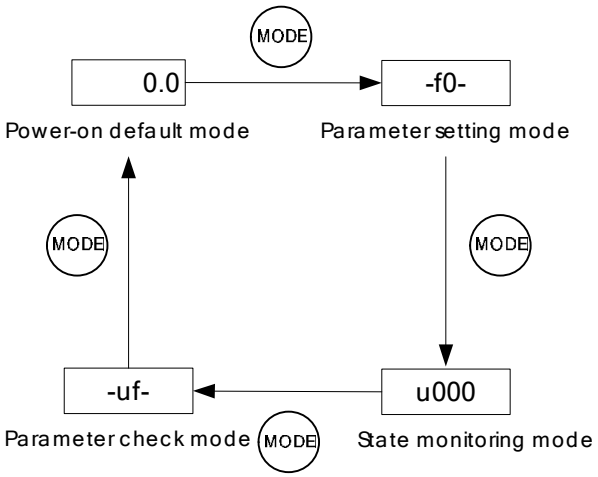


Figure 4.2 Structure of Inverter Mode switch

<1>: when F618=1, show parameter setting mode

4.2.2. Powering-on default mode

The display data is the current output frenquncy under Powering-on default mode, so directly use ▲or▼ key to modify the digital frequency setting, then press the ENT key to save the modified data and return Powering-on default mode, or press the ESC key to give up the modification and return the Powering-on default mode.As showed as Figure 4.3

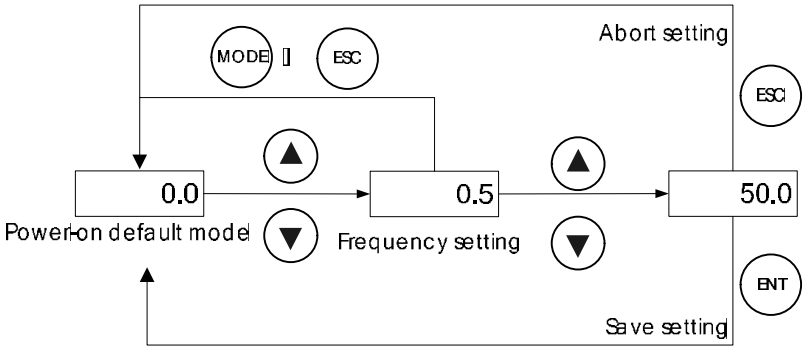


Figure 4.3 Powering-on default mode Navigation

Here the display data type can be set freely under the Powering-on default mode,showed in the parameter F610

4.2.3. Parameter Setting Mode

There are 10 groups function parameters fromF0 group to F9 group,each group includes different numbers function parameter. The Parameter setting value can be modified by ▲or▼key and ENT key, or give up the modification by ESC key, as showed as Figure 4.4

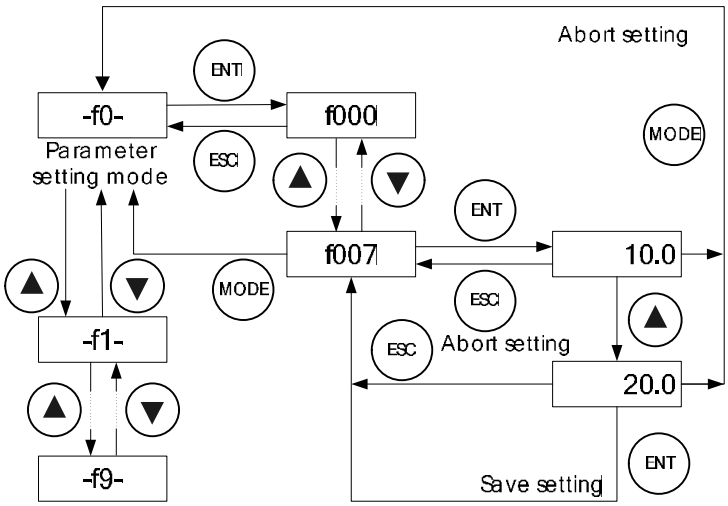


Figure 4.4 Parameter Setting Mode navigation

4.2.4. Status monitoring mode

The status monitoring mode can be used to monitor the current running status of inverter, or check the fault record, the operation shows as the Figure 4.5

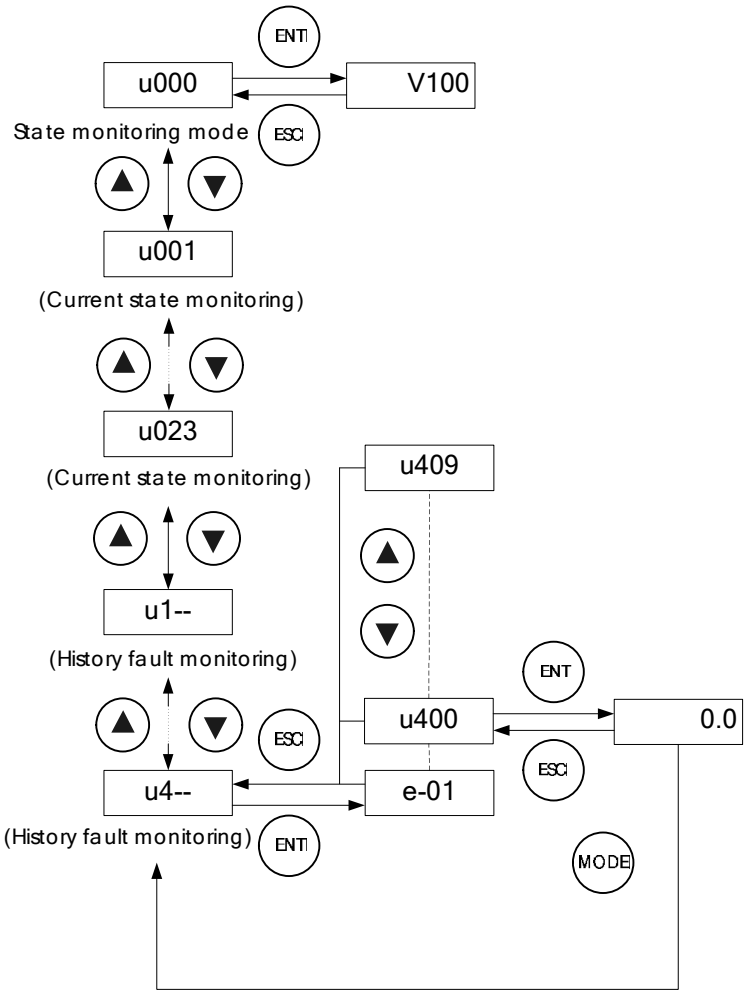


Figure 4.5. State monitoring mode navigation

Here: Monitoring parameter only can be used to check, cannot be modified or set.

4.2.5. Parameter verifying mode

When F618=1,

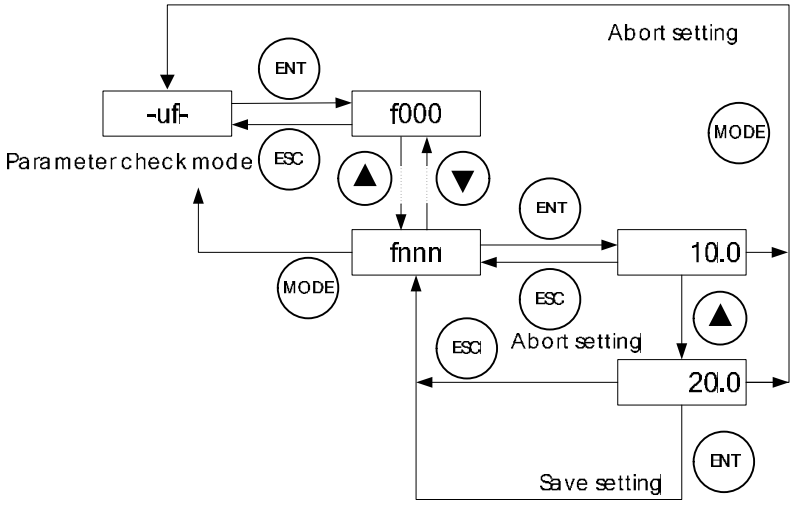


Figure 4.6 Parameter verifying mode navigation

4.2.6. JOG

Under the powering-on mode, when F700=1, press the Jog key then enter the Jog state. Jog represents forward jog and –jog represents reverse jog. Switch between forward/reverse jog can be realized through UP/DOWN keys on the keyboard panel.

4.3. Switching on and confirmation of display status

Before switching on the inverter, please do confirm the following items.

Table 4.2 Items to be confirmed prior to switching on the inverter

Item	Description
Confirmation of input power supply voltage	Please confirm if the power suppy is correctly connected (3-phase, 380VAC ~ 480VAC, 50/60 Hz) Please confirm if the power supply input terminals R/L1, S/L2 and T/L3 are properly connected. Please confirm whether the inverter and the motor are correctly grounded.
Confirmation of connection of inverter main circuit output terminals with motor	Please confirm the output terminals of the inverter U, V and W are reliably connected with the 3-phase input terminals of the motor.
Confirmation of the connection of the inverter control circuit terminals	Please confirm the control circuit terminals of the inverter are reliably connected with other control devices.
Confirmation of the state of the inverter control terminals	Please confirm that all control circuit terminals are in the state OFF (The inverter does not run when powered on).
Confirmation of the state of the load	Please confirm the condition of the motor load (namely the status of connection with mechanical system).

After the inverter is switched on, the keyboard panel enters into Powering-on mode. The displayed value type at Powering-on mode is determined by the setting value of parameter F610.

4.3.1. Local control mode

QD200 series frequency inverters provide two control modes: local and remote. The mode is set with parameter F601.

At local control mode, both the command source and frequency setting source of the inverter are set through the keyboard panel:

1. Command source is given through RUN and STOP keys in order to run or stop the motor.
2. Frequency is given by UP and DOWN keys. Under Powering-on mode, directly press UP key to increase given frequency or DOWN key to reduce given frequency.

Motor rotation direction: Press down the ENT key, then press UP key to set the motor rotation direction as FORWARD; Press down the ENT key, then press DOWN key to set the motor rotation direction as REVERSE. Paremeter F522 is used to limit the ablilty of the motor to rotate only in a single direction.

Fault reset: When fault occurs in the inverter, the keyboard panel displays the fault code under Powering-on mode. At this time press the STOP key and the keyboard panel displays a-00. Then press the STOP key again to finish fault reset function. Please see parameter F600.

Note 1: During the reverse rotation of the motor or when there is instruction of reverse rotation, the function indication lamp REV on the keyboard panel is on.

Note 2: Under local control mode, the function indication lamp LOC on the keyboard panel is on.

4.3.2 Remote control mode

Under remote control mode, the command source and frequency setting source of the inverter are set through parameters F002 and F003 respectively. The command source and frequency setting source can be combined in any way. For example, when F002= 1, F003= 3, the control effect of the inveter is the same as under the local control mode.

Example 1: Two-wire control running

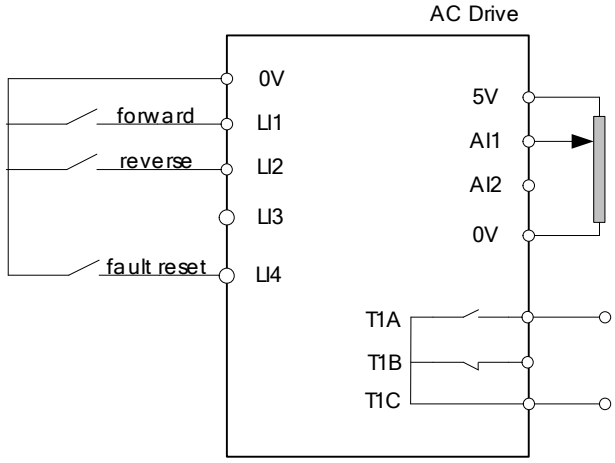


Figure 4.7 Example of wiring for two-wire control running

Table 4.3 Parameter configuration of two-wire control running

Code	Parameter	Setpoint	Setpoint
f002	Selection of run command	0	0
f003	Selection of frequency command selection	1	1
f300	AI1 input function (analog or logic selection)	0	0
f301	L1 logic input function	2	62
f302	L2 logic input function	3	63
f303	L3 logic input function	30	10
f305	Logic input mode setting	0	0
f306	Logic input type selection	1	1
f309	Forced- effective Logic input function selection	1	0
f310	Forced- effective Logic input function selection 2	0	0
f522	Prohibit motor reverse	0	0

Note: When two-wire control is applied, logic input function 30 must be disabled.

Example 2: Three-wire control running(Negative logic, decelerates to stop)

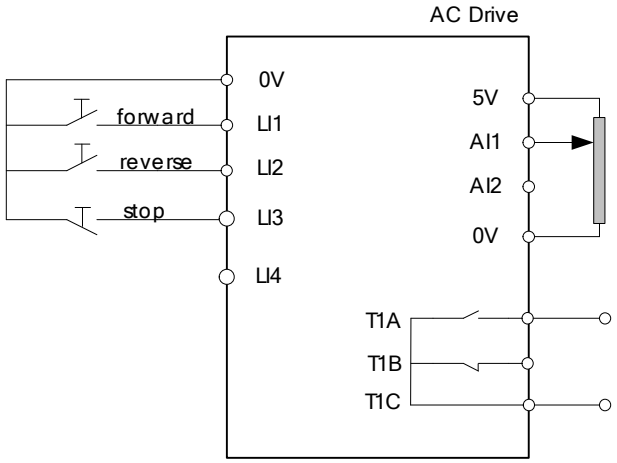


Figure 4.8 Example of wiring for three-wire control running

Table 4.4 Parameter configuration of 3-wire control running

Code	Parameter	Setvalue
f002	Selection of run command	0
f003	Selection of frequency command selection	1
f300	AI1 input function (analog or logic selection)	0
f301	L1 logic input function	2
f302	L2 logic input function	3
f303	L3 logic input function	30
f305	Logic input mode setting	0
f306	Logic input type selection	1
f309	Forced- effective Logic input function selection	1
f310	Forced- effective Logic input function selection 2	0
f522	Prohibit motor reverse	0

Example 3: Three-wire control running(Negative logic, motor stops freely)

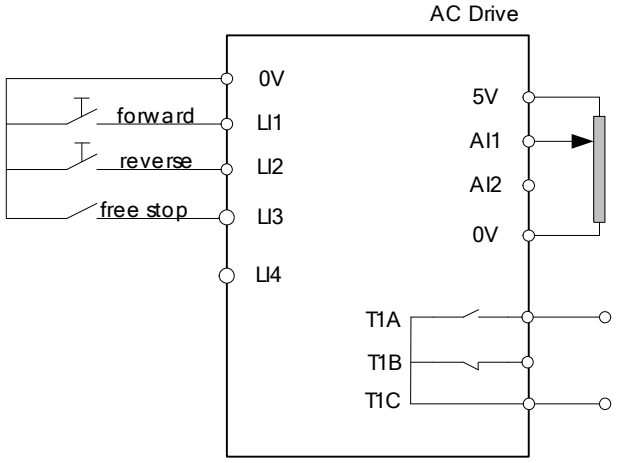


Figure 4.9 Example of wiring for 4-20mA control running

Table 4.5 Parameter configuration of Three-wire control running(Negative logic, Free stop)

Code	Parameter	Setvalue
f002	Selection of run command	0
f003	Selection of frequency command selection	1
f300	AI1 input function (analog or logic selection)	0
f301	L1 logic input function	2
f302	L2 logic input function	3
f303	L3 logic input function	34
f305	Logic input mode setting	0
f306	Logic input type selection	1
f309	Forced- effective Logic input function selection	1
f310	Forced- effective Logic input function selection 2	30
f522	Prohibit motor reverse	0

Example 4: UP/DOWN acceleration and deceleration(Negative logic)

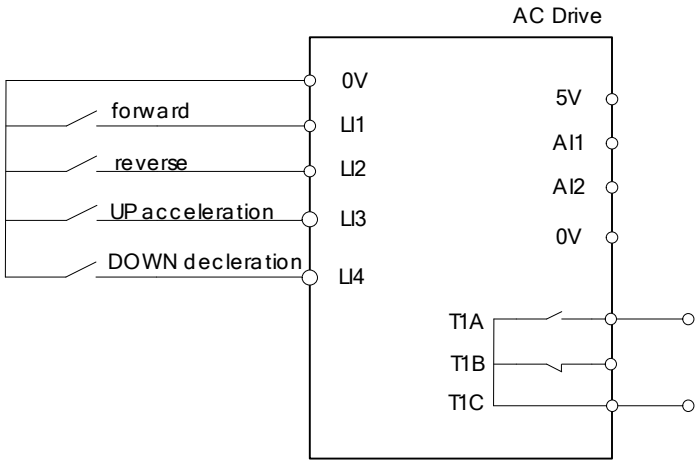


Figure 4.10 Example of wiring for three-wire control running

Table 4.6 Parameter configuration of UP/DOWN acceleration and deceleration(Negative logic)

Code	Parameter	Setvalue
f002	Selection of run command	0
f003	Selection of frequency command selection	5
f301	L1 logic input function	2
f302	L2 logic input function	3
f303	L3 logic input function	23
f304	L4 logic input function	24
f306	Logic input type selection	1
f309	Forced- effective Logic input function selection	1
f310	Forced- effective Logic input function selection 2	0
f522	Prohibit motor reverse	0

Example 5: Multistep speed control running(Negative logic)

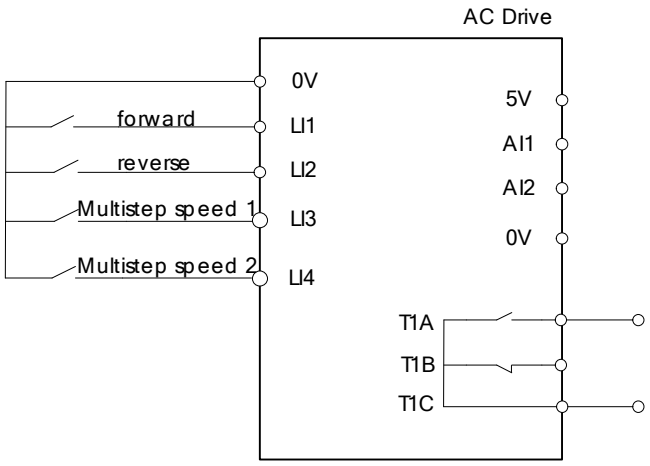


Figure 4.11 Example of wiring for multistep speed control running

Table 4.7 Parameter configuration of multistep speed control running

Code	Parameter	Setvalue
f002	Selection of run command	0
f003	Selection of frequency command selection	5
f301	L1 logic input function	2
f302	L2 logic input function	3
f303	L3 logic input function	23
f304	L4 logic input function	24
f306	Logic input type selection	1
f309	Forced- effective Logic input function selection	1
f310	Forced- effective Logic input function selection 2	0
f522	Prohibit motor reverse	0
f000	Inverter frequency digital setting	Equal to multistep speed 0
f716	Multistep speed 1	Multistep speed 1
f717	Multistep speed 2	Multistep speed 2
f718	Multistep speed 3	Multistep speed 3

Example 6: JOG control

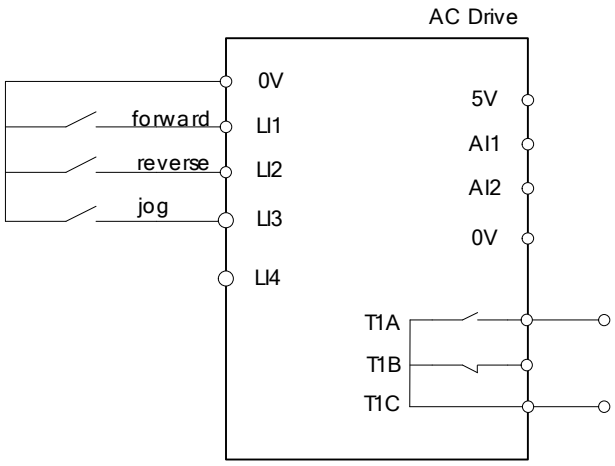


Figure 4.12 Example of wiring for JOG control

Table 4.8 Parameter configuration of JOG control(Negative logic)

Code	Parameter	Setvalue
f002	Selection of run command	0
f301	L1 logic input function	2
f302	L2 logic input function	3
f303	L3 logic input function	4
f306	Logic input type selection	1
f309	Forced- effective Logic input function selection	1
f310	Forced- effective Logic input function selection 2	0
f522	Prohibit motor reverse	0
f701	Jog frequency	Set by yourself
f702	Jogging stop mode	Set by yourself

5. DETAILED PARAMETER DESCRIPTION

5.1. Basic parameter group

NO.	Parameter Name	Setting Range	Default
f000	Operation frequency of keypad	f009~f008	0.0

When power on, the inverter displays the operation frequency(when operation stopped, “0.0” is displayed, see f610. Then press the ▲ key or the ▼ key to change the operation frequency (even during operation).

Press ▲ move the frequency up. Press ▼ move the frequency down, Press the ENT key to save the operation frequency f000, and the set frequency are displayed alternately.

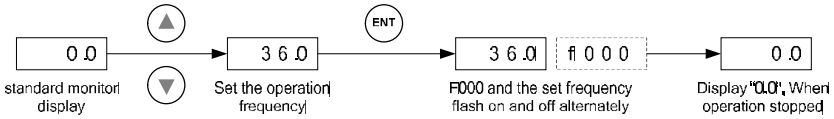


Figure 5.1 Procedure of setting f000

Note1: when set f003=3, f000 is effective as the frequency command.

Note2: Pressing the ▲key or the ▼ key will change the operation frequency even during operation.

NO.	Parameter Name	Setting Range	Default
f001	V/F control mode selection	0~3	0

0: V/F constant. When one single inverter is required to drive more than one motor, please select V/f control mode if motor automatic tuning can not be correctly performed or there is no other access to acquire parameters of controlled motor. To increase the torque further, increase the setting value of the manual torque boost.

1: Variable torque. This is appropriate for load characteristics of such things as fans, pumps and blowers in which the torque in relation to load rotation speed is proportional to its square.

2: Sensor-less vector control. Using sensor-less vector control with a standard motor will provide the highest torque at the low speed ranges.

(1) Provides large starting torque.

(2) Effective when stable operation is required to move smoothly up from the low speeds.

(3) Effective in elimination of load fluctuations caused by motor slippage.

3: Energy saving. Energy can be saved in all speed areas by detecting load current and flowing the optimum current that fits the load.

Note: To use vector control and automatic energy saving, motor constant setting (motor tuning) is required.

NO.	Parameter Name	Setting Range	Default
f002	Command mode selection 1	0~2	1

0: Terminal board. ON and OFF of an external signal Runs and stops operation.

1: Keypad. Press the <RUN> and <STOP> keys on the keypad to start and stop.

2: Serial communication. Run and stop through serial communication.

Note: When under local control (f601=0), f002 setting is ignored, Keypad is always effective.

NO.	Parameter Name	Setting Range	Default
f003	Frequency setting mode selection 1	0~7	3

0: Built-in potention meter.

1: AI1 input. Frequency command is set by means of a signal from an external input device (AI1 terminal: 0-5V, 0-10Vdc or 4-20mAdc).

2: AI2 input. An external signal (AI2 terminal: 0-10Vdc) is used to specify a frequency command.

3: Keypad (f000). Press the <▲> key or the <▼> key on either the keypad or the expansion panel (optional) to set frequency.

4: Serial communication. Frequency command is set by commands from an external control unit.

5: UP/DOWN setting from external contact. Terminals are used to specify an up/down frequency command.

6: AI1+AI2.

7: PID setting of keypad.

Note 1: When under local control(f601=0), f003 setting is ignored, and f000 is always effective.

Note 2: In the case when there is no valid frequency command (e.g, frequency command is under starting frequency setting f503), the motor does not run even if the inverter receives the run command. At this time the RUN led on the keypad blinks.

Note 3: When f003 = 7, use f830 as the PID setting.

NO.	Parameter Name	Setting Range	Default
f004	Command mode selection 2	0~2	0

Setting method is the same as f002.

Note: Switching operation between f002and f004 can be set input terminal function 67 (or 68) beforehand to an input contact terminal. When switching the terminal operation mode to panel operation mode:

If f502 = 1, the motor will keep the running status befor switch operation.

If f502 = 0, the motor stops regardless the running status befor the switch operation.

NO.	Parameter Name	Setting Range	Default
f005	Frequency setting mode selection 2	0~7	2

Setting method is the same as f003.

Note: About switching between f003 and f005operation, see f006.

NO.	Parameter Name	Setting Range	Default
f006	Frequency priority selection	0~1	0

0: f003 is switchable to f005by the input terminal (Input terminal function 20).

1: f003.

Switching between the frequency commands specified with f003 and f005 can be made by entering a command from a input contact terminal. To do so, however, the frequency command forced switching function (input terminal function 20) needs to be set beforehand to an input contact terminal.

If OFF: The frequency command specified with f003 will be selected.

If ON: The frequency command specified with f005 will be selected.

NO.	Parameter Name	Setting Range	Default
f007	Maximum frequency	30.0 ~ 400.0 Hz	50.0
f008	Upper limit frequency	0.5 Hz ~f007	50.0
f009	Lower limit frequency	0.0 Hz ~f008	0.0

f007 sets the range of frequencies output by the inverter (maximum output values). This frequency is used as the reference for acceleration/deceleration time.

f008 and f009 set the upper and lower limit frequency that determines motor rotation speed range.

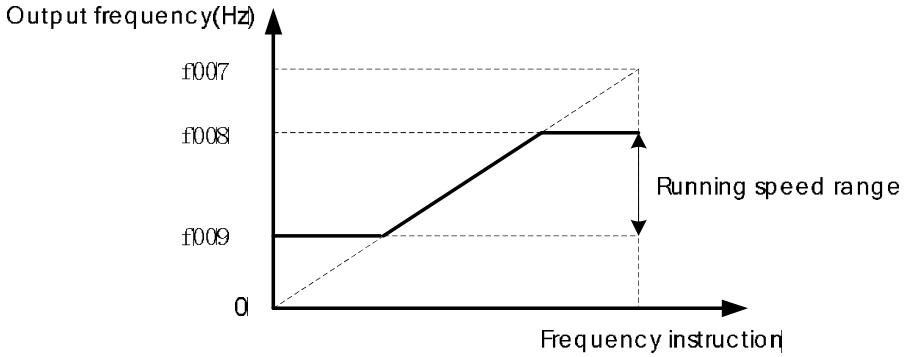


Figure 5.2 Relation of f007, f008, f009and running speed

Note1:Set f007、f008、f009 carefully. The motor output frequency is affected not only by these three parameters, but also by start frequency, DC braking initial frequency and skip frequency.

Note 2: The following condition must be true when setting up these parameters: f009≤ f008 ≤ f007.

NO.	Parameter Name	Setting Range	Default
f010	Acceleration time 1	0.0 ~ 3200 s	varies by model
f011	Deceleration time 1	0.0 ~ 3200 s	varies by model

f010 sets the time that it takes for the inverter output frequency to go from 0Hz to maximum frequency f007.

f011 programs the time that it takes for the inverter output frequency to got from maximum frequency f007 to 0Hz.

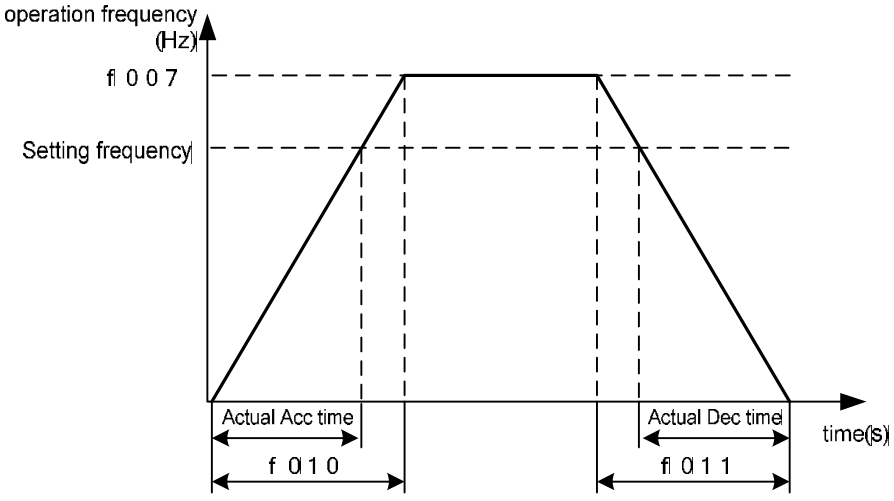


Figure 5.3 Definition of acceleration/deceleration time

When the acceleration/deceleration time is set at 0.0 seconds, the inverter speed increases or reduces within 0.1 seconds.

If the programmed value is shorter than the optimum acceleration/deceleration time determined by load conditions, overcurrent stall or overvoltage stall function may make the acceleration/deceleration time longer than

the programmed time. If an even shorter acceleration/deceleration time is setted, there may be an overcurrent trip or overvoltage trip for inverter protection.

Note: See f518, f520, f519 and f521.

NO.	Parameter Name	Setting Range	Default
f012	PWM carrier frequency	1.5 ~ 12.0 kHz	varies by model

Increase of the switching frequency may reduce the magnetic noise of the motor. However, enhancement of switching frequency will increase heat dissipation. In the event of increase of switching frequency, the capacity of the inverter may require corresponding derating.

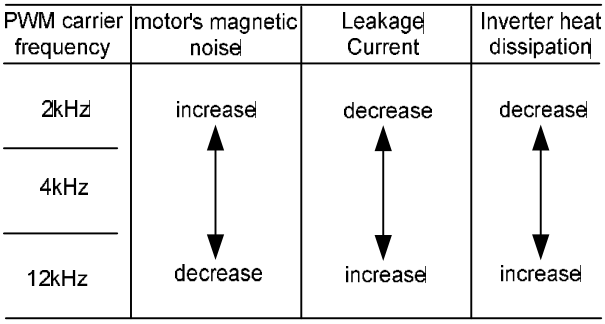


Figure 5.4 Impact on inverter performace by changing carrier frequency

Table 5.1 default carrier frequency value of different model capacity

Model	Max. of F300 (kHz)	Min. of F300 (kHz)	default of F300 (kHz)
0.4 ~ 11 kW	12.0	1.5	8.0
15 ~ 30 kW	8.0	1.5	4.0
37 ~ 500 kW	4.0	1.5	2.0

Note: Although the electromagnetic noise level is reduced, the motor acoustic noise may be increased.

NO.	Parameter Name	Setting Range	Default
f013	Carrier frequency control mode selection	0~1	1

0: Carrier frequency not reduced automatically

1: Carrier frequency reduced automatically.

Reduction of rated current will be required if the PWM carrier frequency is set high.

When the PWM carrier frequency is set high, selecting “Carrier frequency not reduced automatically” may causes the inverter to be tripped (overheat) more easily than selecting “Carrier frequency reduced automatically“.

Switching frequency level will be automatically controlled in case of overheat trip in the inverter. If the inverter detects upcoming overheat fault, it will lower the switching frequency to reduce the heat dissipation from the drive. With the temperature tending to normal, the switching frequency will return to the level selected by f012.

NO.	Parameter Name	Setting Range	Default
f014	Random PWM mode	0~1	0

0: Disable.

1: Enable. The random mode reduces motor electromagnetic noise by changing the PWM pattern.

NO.	Parameter Name	Setting Range	Default
f015	Automatic acceleration/deceleration	0~2	0

0: Disabled (manual).

1: Automatic (at acceleration & deceleration)

2: Automatic (only at acceleration)

Adjusts the acceleration/deceleration time automatically within the range of 1/8 to 8 times as long as the time set with the (f010 or f011), depending on the current rating of the inverter.

When automatically setting acceleration/deceleration time, always change the acceleration /deceleration time so that it conforms to the load. The acceleration/deceleration time changes constantly with load fluctuations. For inverters that requires a fixed acceleration/deceleration time, use the manual settings (f010 and f011), and set f015 = 0.

Setting acceleration/deceleration time (f010 and f011) in conformance with mean load allows optimum setting that conforms to further changes in load.

Use this parameter after actually connecting the motor.

When the inverter is used with a load that fluctuates considerably, it may fail to adjust the acceleration or deceleration time in time, and therefore may be tripped.

Note: Manual acceleration and deceleration time may still be restrained by motor current amplitude limit (See f107) and overvoltage fault protection (See f415) and overvoltage fault operation level . function (See f416).

NO.	Parameter Name	Setting Range	Default
f016	Factory reserved		

NO.	Parameter Name	Setting Range	Default
f017	Parameter setting mVSCo function	0~3	0

0: Disabled. Even if set to 0, f017 will not return the setting you made to its factory default.

1: 2-wire control (sink mode, slowdown stop).

2: 3-wire control (sink mode, slowdown stop).

3: External input UP/DOWN setting (sink mode, slowdown stop).

Note 1: Automatically programs all parameters (parameters described below) related to the functions by selecting the inverter's operating method. The major functions can be programmed simply.

Note 2: When this parameter is invoked after it has been set, 0 is always displayed (on the right side). The number on the left side refers to the number specified previously.

E.g. 1 0.

Note 2: Negative logic means the common point of all input terminal is connected to “0V” terminal on inverter, while positive logic mode connected to “24V” terminal, see f306.

NO.	Parameter Name	Setting Range	Default
f018	Factory reserved		
f020	Factory reserved		

5.2 Motor and its protection parameter group

NO.	Parameter Name	Setting Range	Default
f100	Auto-tuning	0~2	0

0: Auto-tuning disabled (use of internal parameters).

1: Application of individual settings of f203 (after execution: 0).

2: Auto-tuning enabled (after execution: 0).

When auto-tuing, set the following parameters at least, as specified on the nameplate of the motor: f101~f104.

Set f100 to 2 before the start of operation. Tuning is performed at the start of the motor then.

Check to be sure that the setting of the parameter f101 and that of the parameter f102 agree with the base frequency (rated rotational speed) and base frequency voltage (rated voltage) of the motor to be operated, respectively. If not, set the parameters correctly.

When using the inverter to control the operation of a motor smaller in capacity by one grade or more, be sure to set the motor rated current setting parameter (f103) properly.

Vector control may not operate properly if the motor capacity differs from the applicable rated capacity of the inverter by more than two grades.

If current waveforms oscillate during operation, increase the speed control stability factor (f208). This is effective in suppressing oscillation.

Precautions on auto-tuning:

(1) Conduct auto-tuning only after the motor has been connected and operation completely stopped. If auto-tuning is conducted immediately after operation stops, the presence of a residual voltage may result in abnormal tuning.

(2) Voltage is applied to the motor during tuning even though it barely rotates. During tuning, “tun1” is displayed on the keypad.

(3) Tuning is performed when the motor starts for the first time after f100 is set to 2.

Tuning is usually completed within three seconds. If it is aborted, the motor will trip with the display of e-46 and no constants will be set for that motor.

(4) High-speed motors, high-slip motors or other special motors cannot be auto-tuned.

(5) Provide cranes and hoists with sufficient circuit protection such as mechanical braking. Without sufficient circuit protection, the resulting insufficient motor torque during tuning could create a risk of machine stalling/falling.

(6) If auto-tuning is impossible or an "e-46" auto-tuning error is displayed.

(7) If the inverter is tripped during auto-tuning because of an output phase failure (e-42), check if the inverter is connected to the correctly. A check for output phase failures is made during auto-tuning, regardless of the setting of the output phase failure detection mode selection parameter (f406).

NO.	Parameter Name	Setting Range	Default
f101	Base frequency 1	25.0~400.0 Hz	50.0
f102	Base frequency voltage1	50~660V	varies by model
f103	Motor rated current	varies by model	varies by model
f104	Motor rated speed	100~15000 rpm	varies by model

Set f101 ~f104, as specified on the nameplate of the motor

To use vector control, and automatic energy saving, motor constant setting (motor tuning) is required.

NO.	Parameter Name	Setting Range	Default
f105	Motor no-load current	10.0~100.0%	varies by model

Set the ratio of the no-load current of the motor to the rated current. Enter the value in % that is obtained by dividing the no-load current by the rated current.

NO.	Parameter Name	Setting Range	Default
f106	Motor electronic thermal protection level 1	varies by model	varies by model

Set the motor rated current specified on the namelate of the motor to f106. This parameter allows selection of the appropriate electronic thermal protection characteristics according to the particular rating and characteristics of the motor.

Note: If f603=1, f106 displays in amperes/volts. If f603=0, f106 displays in % term. The 100% standard value is the rated output current indicated on the nameplate.

NO.	Parameter Name	Setting Range	Default
f107	stall prevention level 1	varies by model	varies by model

This parameter adjusts the output frequency by activating a current stall prevention function against a current exceeding the f107 specified level.

Note 1: Do not set f107 under the rated motor no-load current. Otherwise the inverter will determine that it is performing motor braking and increase the frequency applied to the motor.

Note 2: If f603=1, f107 displays in amperes/volts. If f603=0, f107 displays in % term. The 100% standard value is the rated output current indicated on the nameplate.

Note 3: When inverter current is exceeding the f107 specified level:

- Output frequency is adjusted current exceeding the f107 specified level.
- During an OC alarm status, (that is, when there is a current flow in excess of the stall prevention level), the output frequency changes. At the same time, “---c” is displayed flashing on and off.

NO.	Parameter Name	Setting Range	Default
f108	Base frequency 2	25.0~400.0 Hz	50.0
f109	Base frequency voltage 2	50~660 V	varies by model
f110	Motor electronic-thermal protection level 2	varies by model	varies by model
f111	Stall prevention level 2	varies by model	varies by model

Setting method is the same as f101、f102、f106、f107.

Use the above parameters to switch the operation of two motors with a single inverter and to select motor V/F characteristics (two types) according to the particular needs or operation mode.

The f001 (V/F control mode selection) parameter is enabled only for motor1.If motor 2 is selected, V/F control will be given constant torque characteristics.

NO.	Parameter Name	Setting Range	Default
f112	Factory reserved		
f113	Factory reserved		
f114	Factory reserved		
f115	Factory reserved		

NO.	Parameter Name	Setting Range	Default
f120	Default setting	0~9	0

0: -

1: Standard default setting (Initialization)

2: Save user-defined parameters

3: Call user-defined parameters

4: Trip record clear

5: Cumulative operation time clear

6: Cumulative fan operation time record clear

7: Initialization of type information

8: P-type rating. (Nomal duty, for variable torque load characteristic like pumps and fans).

9: G-type rating. (Heavy duty, for constant torque load characteristic).

Note1: This function will be displayed as 0 during reading on the right. This previous setting is displayed on the left. Example: 1 0. f120 cannot be set during the inverter operating. Always stop the inverter first and then program.

Note 2: Even set f120=1, f300, f333, f334, f335, f336, f348, f349 will not be reset to their factory default settings.

Note 3: G-type and P-type: G-type refers to applications requiring constant torque output, while P-type applications with variable torque needs. The drive allows the user to select G-type or P-type ratings for the inverter depending on the application. Fans, pumps, and blowers should use P-type (f120 = 8), and other applications generally use G-type (f120 = 9). Differences between G-type ratings and P -type ratings for the drive include rated input and output current, overload capacity, carrier frequency, and current limit.

Duty types	Stall prevention level	overload tolerance	First digit of u000 display
G-type (heavy duty)	150%	150% rated output current for 60 s	“g” (e.g. g100)
P-type(Normal duty)	120%	120% rated output current for 60 s	“p” (e.g. p100)

Note 4:when set f120=1, the default setting is for G-type rating.

5.3 Motor control parameter group

NO.	Parameter Name	Setting Range	Default
f201	Supply voltage correction (limitation of output voltage)	0~3	3

0: Supply voltage uncorrected, output voltage limited.

1: Supply voltage corrected, output voltage limited.

2: Supply voltage uncorrected, output voltage unlimited.

3: Supply voltage corrected, output voltage unlimited.

If f201 is set to "0" or "2", the output voltage will change in proportion to the input voltage.

Even if the base frequency voltage (f102) is set above the input voltage, the output voltage will not exceed the input voltage.

The rate of voltage to frequency can be adjusted according to the rated motor capacity. For example, setting f201 to "0" or "1" prevents the output voltage from increasing, even if the input voltage changes when operation frequency exceeds the base frequency.

When the V/F control mode selection parameter (f001) is set to any number between 2 and 3, the supply voltage is corrected regardless of the setting of f201.

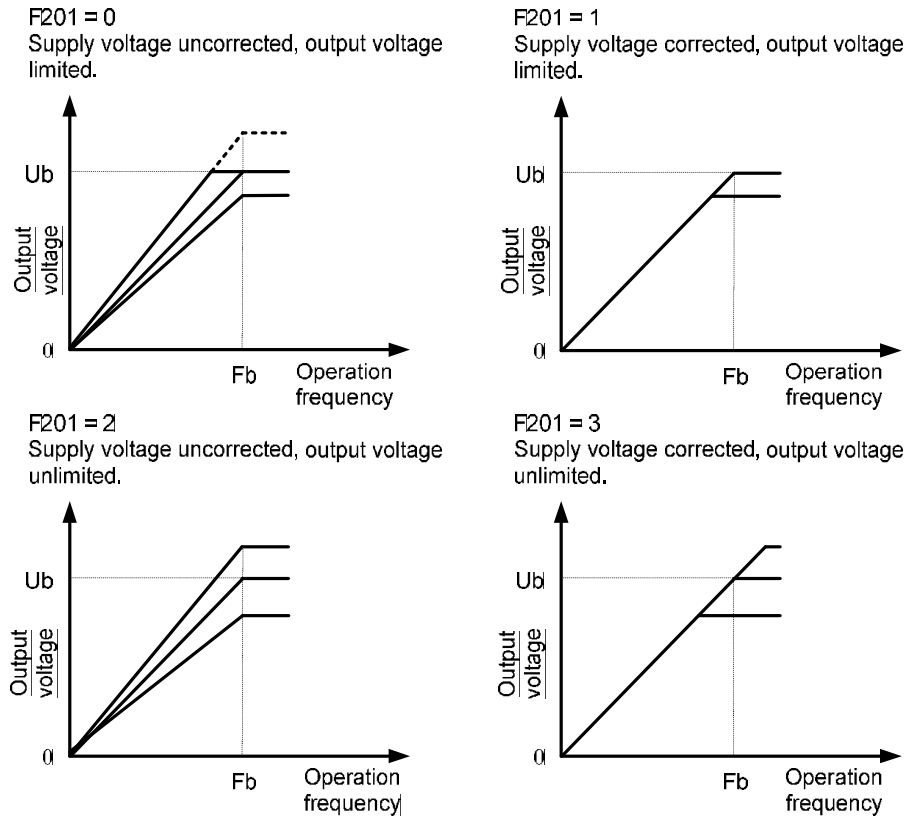


Figure 5.5 Description of voltage correct and voltage limit

NO.	Parameter Name	Setting Range	Default
f202	Voltage boost 1	0.0~30.0%	varies by model
f203	Torque boost	0.0~30.0%	varies by model

If torque is inadequate at low speeds, increase torque by raising the torque boost rate with these two parameters. Perform adjustments according to the actual operation.

f202 is effective when f001 is set to 0 (V/F constant) or 1 (square reduction).

f203 is effective when f001 is set to 2 (SVC mode).

Note: Be careful not to increase the voltage boost or torque boost rate too much because it could cause an overcurrent trip or e-45 at startup.

NO.	Parameter Name	Setting Range	Default
f204	Slip frequency gain	0~150 %	50

Set the compensation gain for the slipping of the motor. A higher slip frequency gain reduces motor slipping correspondingly.

Note1:.After setting f104, set f204 to adjust in detail.

NO.	Parameter Name	Setting Range	Default
f205	Exciting current coefficient	100~130 %	100

f205 is used to fine adjust the magnetic field increase rate in low-speed range. To increase the torque in low-speed range, specify a larger value for F205.

Note: This parameter should be adjusted only when enough torque cannot be obtained, even though auto-tuning (f100 = 2) was made after the setting of the parameters f204 and f203. Note also that adjusting this parameter may cause an increase in the no-load current in low-speed range. If the no-load current exceeds the rated current, do not adjust this parameter.

NO.	Parameter Name	Setting Range	Default
f206	Voltage boost 2	0~30 %	varies by model

Setting method is the same as f202.

NO.	Parameter Name	Setting Range	Default
f207	Speed control response coefficient	1~150	40
f208	Speed control stability coefficient	1~100	20

Use these two parameters to adjust the speed of response and stability to the frequency command.

How to make adjustments according to the moment of inertia of the load:

The moment of inertia of the load (including that of the motor shaft) was set at the factory on the assumption that it would be three times as large as that of the motor shaft. If this assumption does not hold, calculate the values to be entered in f207 and f208, using the following equations. f207 = $40\times\sqrt{a/3}$, f208 = $20\times\sqrt{a/3}$, Where ‘a’ is the times by which the moment of inertia of the load is larger than that of the motor. After the above adjustments, if necessary, make fine adjustments as described below.

• To increase(reduce) the response speed: Increase (reduce) the setting of f207.
• If overshooting or hunting occurs: Increase the setting of f208.
• If reduction gears or the like squeak: Increase the setting of f208.
• If an over-voltage trip occurs on completion of acceleration: Increase the setting of f208.

Note 1: When making the above adjustments, increase or decrease settings in steps of 10% or so while checking how things change.

Note 2: Depending on the settings of f207 and f208, the frequency may exceed the upper-limit frequency if the inverter is set so as to accelerate the load in the shortest possible time.

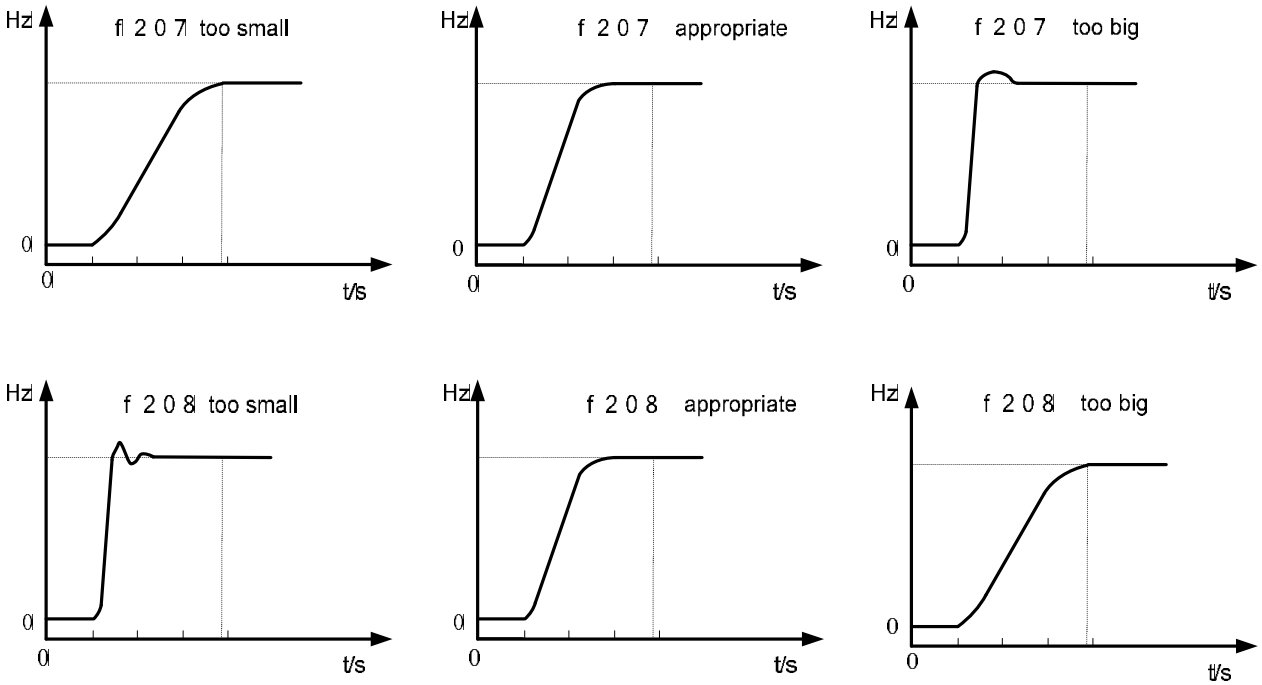


Figure 5. 6 Relations of speed response and f207 , f208

NO.	Parameter Name	Setting Range	Default
f209	Stall prevention control coefficient 1	10~250%	100

Use this parameter along with f210 adjusts characteristics in a region in which the frequency is above the base frequency (region where the field is weak). If a heavy load is applied instantaneously (or transiently), the motor may stall before the load current reaches the current set with the stall prevention level 1 parameter (f107). In many cases, this kind of stall can be avoided by gradually reducing the setting of f209.

NO.	Parameter Name	Setting Range	Default
f210	Stall prevention control coefficient 2	50~150%	100

Using this parameter along with f209 adjusts characteristics in a region in which the frequency is above the base frequency (region where the field is weak).

* How to make adjustments in a region (region where magnetic field is weak) above the base frequency:

A drop in supply voltage may cause fluctuations of the load current or vibration of the motor. In some cases, such phenomena can be eliminated by changing the setting of f210 to between 80 and 90. However, this may cause an increase in load current, so that it is also necessary to adjust the setting of the electronic thermal protective level 1 parameter (f106) properly according to the motor capacity.

NO.	Parameter Name	Setting Range	Default
f211	Maximam voltage adjustment coefficient	90~120%	104

Specify a larger value for f211 to secure as high an output voltage as possible in a region (region where magnetic field is weak) above the base frequency. Setting f211 to a larger value may cause the motor to vibrate or gears to squeak. If such a phenomenon occurs, do not adjust this parameter.

NO.	Parameter Name	Setting Range	Default
f212	Waveform switching adjustment coefficient	0.1~14.0kHz	14.0

Specify a larger value for f212 if switching from a waveform to another resulting in a considerable increase in vibration and noise in middle-speed range (region between the start frequency and the base frequency). If no improvement can be made by specifying a larger value, do not adjust this parameter.

NO.	Parameter Name	Setting Range	Default
f213	factory reserved		
f214	factory reserved		
f215	factory reserved		
f216	factory reserved		

NO.	Parameter Name	Setting Range	Default
f217	multipoint profile V/F patter	0~2	0

0: factory reserved.

1: factory reserved.

2: Enable multipoint profile V/F patter.

The drive utilizes a set V/f pattern (f217 = 2) to determine the appropriate output voltage level for each relative to the frequency reference.

NO.	Parameter Name	Setting Range	Default
f218	point 1 output frequency (f1)	0~f220	10.0
f219	point 1 output frequency voltage (V1)	0~100%	20.0
f220	point 2 output frequency (f2)	f218~f220	20.0
f221	point 2 output frequency voltage (V2)	0~100%	40.0
f222	point 3 output frequency (f3)	f220~f101	30.0
f223	point 3 output frequency voltage (V3)	0~100%	60.0

Set up the V/f pattern with f218~f223 as shown in according to the load characteristic.

Note 1: The following condition must be true when setting up the V/f pattern : V1<V2<V3, f1<f2<f3.

Note: Too high voltage output at low speed will cause a serious motor heat dissipation problem, or stall prevetion alarm, or over current trip.

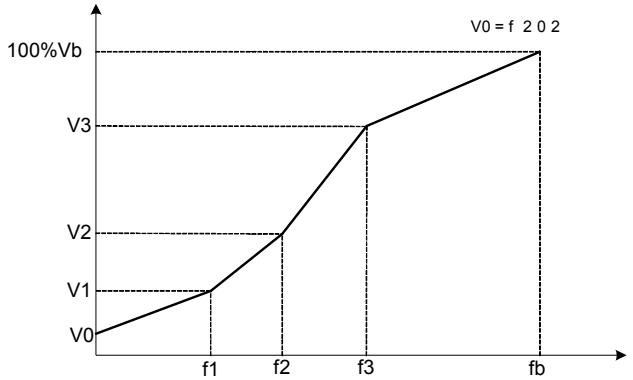


Figure 5.7 Multipoint profile V/F patter (f217 =2)

5.4 Process PID parameter group

NO.	Parameter Name	Setting Range	Default
f300	AI1 terminal function selection	0~2	0

0: AI1 - analog input

1: AI1 - contact input (Sink mode)

2: AI1 - contact input (Source mode)

This parameter allows you to choose between analog signal input and contact signal input for the AI1 terminal.

When using the AI1 terminal as analog input, be sure f305 is configured right (0~5VDC, 0~10VDC, or 0~20mA).

When using the AI1 terminal as contact input terminals in sink logic connection, be sure to insert a resistor between the 24V terminal and the VIA terminal. (Recommended resistance: 4.7kΩ-1/2W).

Note1: Not valid when capacity rating is at 15kw or above.

NO.	Parameter Name	Setting Range	Default
f301	Input terminal function for LI1	0~69	2
f302	Input terminal function for LI2	0~69	3
f303	Input terminal function for LI3	0~69	0
f304	Input terminal function for LI4	0~69	10

Use the above parameters to send signals from an external programmable controller to various control input terminals to operate and/or set the inverter. The desired contact input terminal functions can be selected from table 5.2.

Tabel 5.2 Description of input terminal function

Input terminal function NO.	Function name	Description
0	No function is assigned	Disabled
1	Standby terminal	ON: Ready for operation OFF: Coast stop (gate off)
2	Forward run command	2-wire operation ON: Forward run OFF: Slowdown stop
		3-wire operation OFF→ON: forward run.
3	Reverse run command	2-wire operation ON: Reverse run. OFF: Slowdown stop
		3-wire operation OFF→ON: Reverse run.
4	Jog run mode	ON: Jog run OFF: Jog run canceled
5	Acceleration/deceleration 2 pattern selection	ON: Acceleration/deceleration 2 OFF: Acceleration/deceleration 1 or 3
6	Preset-speed command 1	Selection of 15-speed with LI1 to LI4 (4 bits)
7	Preset-speed command 2	

8	Preset-speed command 3	
9	Preset-speed command 4	
10	Reset command	ON: Acceptance of reset command ON → OFF: Trip reset
11	Trip stop command from external input device	OFF: No Trip ON: e-43 Trip stop according to the stop mode set by f403
13	DC braking command	OFF: No DC braking command ON: DC braking started. DC braking current level and DC braking time is set by f507 and f508 respectively.
14	PID control disabling	OFF: PID control enabled. ON: PID control disabled. The input terminal function of PID control disabling is used for switching between PID control and open-loop control. Clearance of PID integral value function can also be used.
15	Permission of parameter editing	ON: Parameter editing permitted OFF: Parameter editing prohibited (If f700 = 1)
16	Combination of standby and reset commands	ON: Simultaneous input from standby and reset commands
17	Frequency source switching to AI1	ON: Frequency source switched to AI1 OFF: Frequency source as per f003
18	Combination of forward run and jog run	ON: Forward jog operation
19	Combination of reverse run and jog run	ON: Reverse jog operation
20	Frequency setting source switching	ON: The inverter follows the speed setting set by F005 (when F011= 1). OFF: The inverter follows the speed setting set by f003.
21	No.2 Switching of V/F setting	ON: No.2 V/F setting (f001=0、f108、f109、 f110、 f206) OFF: No.1 V/F setting(f001、 f101、f102、 f106、 f202)
22	No.2 motor switching	ON: No.2 motor(f001=0、f108、f109、f110、f111、f206、f518、f519、 f511) OFF: No.1 motor (f001、f010、f011、f101、f102、f106、f107、f202、f510)
23	Frequency UP signal input from external contacts	ON: Increase in frequency
24	Frequency DOWN signal input from external contacts	ON: Reduction in frequency
25	Frequency UP/DOWN cancellation signal input from external contacts	OFF→ON: Resetting of UP/DOWN frequency by means of external contacts
26	inversion of trip stop command from external device	OFF: e-43 Trip stop according to the stop mode set by f403
27	Thermal trip stop signal input from external device	ON: e-25 Trip stop

28	inversion of thermal trip stop signal input from external device	OFF: e-25 Trip stop
29	Forced switching from remote to local control	Enabled when remote control is exercised ON: Local control (setting of cmod, f002、f003 和 f005) OFF: Remote control
30	Operation holding (stop of 3-wire operation)	ON: forward /reverse run held, 3-wire operation OFF: Slowdown stop
31	Forced switching of command mode and terminal board command	ON: Terminal board operation OFF: Setting of f002
32	Display cancellation of the cumulative power amount (kWh)	ON: Monitor display cancellation of the cumulative power amount (kWh)
33	Fire-speed control seef419	ON: Fire-speed operation (preset speed operation frequency f730) OFF: Normal operation
34	Coast stop (gate off)	ON: Coast stop (gate off)
35	Inversion of Reset	ON: Acceptance of reset command OFF→ ON: Trip reset
36	Forced switching of stall prevention level 2	ON: Enabled at the value of f111 OFF: Enabled at the value of f107
37	PID control integral value clear PID control integral value clear	ON: PID control integral value always zero OFF: PID control permitted
38	inversion of PID error signal	ON: PI error input = feedback – setting OFF: PI error input = setting – feedback
39~69	Not used	

Note1: AI1 and AI2 could be used as contact input terminals (see f300, f308, f313 and f314).

Note 2: The difference between 2-wire control and 3-wire operation configration lies in whether logic input function 30 (3-wire control shutdown input) is used.

NO.	Parameter Name	Setting Range	Default
f305	AI1 voltage-current input selection	0~2	0

0:0 ~ 5V voltage signal input.

1:0 ~ 10V voltage signal input.

2: 0-20mA(4-20mA) current signal input.

Note: AI2 only accept 0~10VDC voltage signal input, setting value of f305 will not change the characteristic of AI2.

NO.	Parameter Name	Setting Range	Default
f306	sink/soruce mode selection	0~1	1

0: Source (Positive) logic terminal mode.

1: Sink (Negative) logic terminal mode

NO.	Parameter Name	Setting Range	Default
f307	AO voltage-current output selection	0~1	1

0: Current signal output.

1: Voltage signal output.

NO.	Parameter Name	Setting Range	Default
f308	Input terminal function of AI1	0~69	0

When f300 disabled, the set value of f308 cannot be read out.

When f300 set at 1or 2, AI1 is enabled, and can be used as a contact input terminal.

NO.	Parameter Name	Setting Range	Default
f309	Always-active terminal selection 1	0~69	1
f310	Always-active terminal selection 2	0~69	0

f309 and f310 specifies an input terminal function that is always to be kept active (ON).

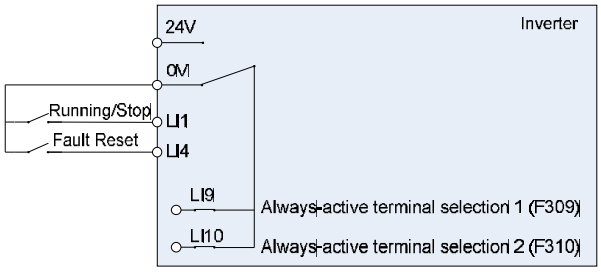


Figure 5.8 Always active terminal function

Note 1: Use f309 and f310 to assign input terminal function to LI9, LI10. LI9 and LI10 are virtual input contact terminal which are always activated. See Figure 5.8.

NO.	Parameter Name	Setting Range	Default
f311	Output terminal function A of LO-CLO	0~255	4
f312	Output terminal function B of LO-CLO	0~255	255

The set method is same as f315.

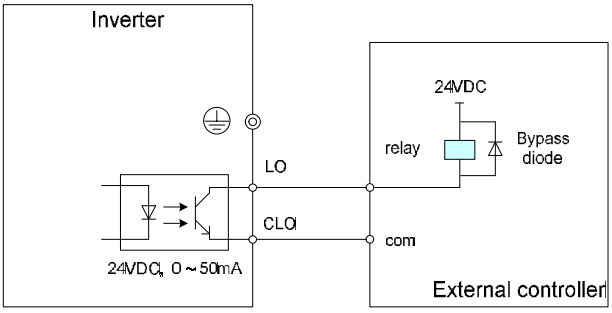


Figure 5.9 Output of LO-CLO wiring example

NO.	Parameter Name	Setting Range	Default
f313	AI1 terminal function selection	0	0

0: AI2 - analog input

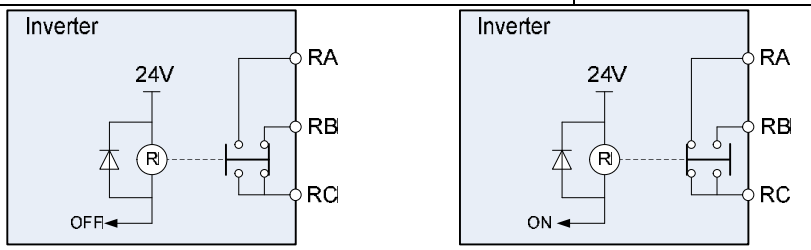
1: AI2 - contact input (Sink)

2: AI2 - contact input (Source)

NO.	Parameter Name	Setting Range	Default
f314	Input terminal function of AI2	0~68	0

The set method is same as f301~f304.

NO.	Parameter Name	Setting Range	Default
f315	Output terminal function A of T1	0~255	40



a) Relay in OFF status b) Relay in ON status

Figure 5.10 Description of relay status

Table 5.3 Description of output terminal function

Output terminal function NO.	Output Status	Description
0	OFF	Output frequency ≤ lower limit frequency setting of f009
	ON	Output frequency > lower limit frequency setting of f009
2	OFF	Output frequency < upper limit frequency setting of f008
	ON	Output frequency = upper limit frequency setting of f008
4	OFF	Output frequency < setting of f337
	ON	Output frequency ≥setting of f337
6	OFF	Output frequency > (set frequency + f339), or < (set frequency - f339)
	ON	(frequency - f339) < output frequency < (set frequency + f339)
8	OFF	Output frequency >(f338+f339), or < (f338-f339)
	ON	(f338-f339) < Output frequency < (f338+f339)
10	OFF	Output frequency ≤ f338-f339
	ON	Output frequency ≥f338+f339
12	OFF	Frequency commanded by f003or f005 ≠AI1 value
	ON	Frequency commanded by f003or f005= AI1 value
14	OFF	Frequency commanded by f003or f005 ≠AI2 value
	ON	Frequency commanded by f003or f005= AI2 value
16	OFF	AI1 value≤f340-f341
	ON	AI1 value ≥f340+f341
18	OFF	AI2 value ≤f342-f343

	ON	AI2 value ≥f342+f343
20	OFF	Terminal other than AI2 selected as frequency command
	ON	AI2 selected as frequency command
22	OFF	Operation stopped
	ON	When operation frequency is output or during (A-07)
24	OFF	Not for ready for operation
	ON	Ready for operation (Input function of standby and run are not ON)
26	OFF	forward run
	ON	reverse run
28	OFF	remote control mode
	ON	local control mode
30	OFF	When inverter is not tripped
	ON	When inverter is tripped or retries.
32	OFF	Torque current is equal to or less than f412 - f413
	ON	Torque current is equal to or larger than f412 set value and longer than f414 set time.
34	OFF	The output current is equal to or larger than f408+f409
	ON	The output current is equal to or less than f408 for f410 set time
36	OFF	When inverter is not significant trip
	ON	When inverter is significant trip
38	OFF	When inverter is not insignificant trip
	ON	When inverter is insignificant trip
40	OFF	When inverter does not trip or retry
	ON	When inverter trips or retries
42	OFF	alarm off
	ON	alarm on
44	OFF	calculated value of motor overload level < 50%
	ON	calculated value of motor overload level ≥ 50%
46	OFF	calculated value of brake resister overload level < 50%
	ON	calculated value of brake resister overload level ≥ 50%
48	OFF	Torque curren < (f412*70% - f413)
	ON	Torque curren ≥ f412*70%
50	OFF	Cumulative operation time ＜f428 setting
	ON	Cumulative operation time ≥f428 setting
52	OFF	Calculation for parts replacement time is shorter than the preset time (internally preset)
	ON	Calculation for parts replacement time is equal to or longer than the preset time (internally preset)
54	OFF	Nomal condition
	ON	PTC detected value ≥ 60% of protection level

56	OFF	Other than undervoltage detected
	ON	Undervoltage detected
58	OFF	Mechnical brake release
	ON	Mechnical brake not release
60	OFF	Motor is not in acceleration state
	ON	Motor is in acceleration state
62	OFF	Motor is not in deceleration state
	ON	Motor is in deceleration state
64	OFF	Motor is not in acceleration or deceleration state
	ON	Motor is in acceleration or deceleration state
65~253	OFF	Not used
	ON	Not used
254	OFF	Output always OFF
255	ON	Output always ON

Note 1: Inversion logic can be obtained by add 1 to the output terminal function mumber. Example: f315=3 is the invertion logic action of f315=2.

Note 2: Output terminal function is available for LO-CLO(f311、f312)和 T1, T2 (f315、f359、f360).

Note 3: Significant trip including follows: e-02, e-03, e-05, e-06, e-07, e-12, e-25, e-31, e-32, e-33, e-36, e-41, e-42, e-43, e-46. Insignificant trip including follows: e-01, e-11, e-21, e-22, e-24.

NO.	Parameter Name	Setting Range	Default
f316	Output terminal logic selection of LO-CLO	0~1	0

0: f311 AND f312. The logical product (AND) of f311 and f312 will be output to LO-CLO.

1: f311 OR f312. The logical sum (OR) of f311 and f312 will be output to LO-CLO.

NO.	Parameter Name	Setting Range	Default
f317	LO-CLO output delay	0~60.0 s	0.0

f317 specified the time of LO-CLO output delay.

NO.	Parameter Name	Setting Range	Default
f318	T1 output delay	0~60.0 s	0.0

f318 specified the time of T1 output delay.

NO.	Parameter Name	Setting Range	Default
f319	External contact input - UP response time	0.0~10.0s	0.1
f320	External contact input - UP frequency steps	0.0 Hz ~f007	0.1
f321	External contact input - DOWN response time	0.0~10.0s	0.1
f322	External contact input - DOWN frequency steps	0.0 Hz ~f007	0.1

These functions take effect when f003 or f005 is set to 5. Two input contact terminals are required to adjust the frequency command: one is used to increase the frequency command (see input terminal function 23), and the other is used to reduce the frequency command (see input terminal function 24). Use an input contact terminal to clear the frequency setting that accumulated by the UP/DOWN operation (see input terminal function 25).

Use f319~f322 set the frequency incremental/decremental gradient.

Frequency command incremental gradient = f320/f319 setting time

Frequency command decremental gradient = f322/f321 setting time

NO.	Parameter Name	Setting Range	Default
f323	Initial up/down frequency	0.0 Hz ~f007	0.0

To adjust the frequency starting at a specified frequency other than 0.0 Hz (default initial frequency) after turning on the inverter, specify the desired frequency using f323 (initial up/down frequency).

NO.	Parameter Name	Setting Range	Default
f324	Change of the initial up/down frequency	0~1	1

0: Disabled. Frequency reference is not memorizied at power off, reset and trip. f323 not changed.

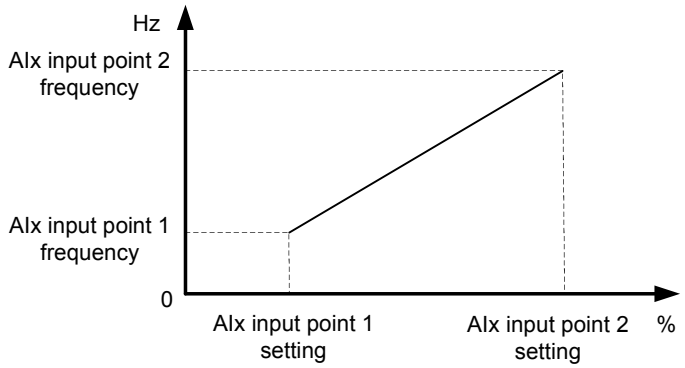
1: Enabled. Frequency reference is memoriziedat power off, reset and trip. f323 changed.

NO.	Parameter Name	Setting Range	Default
f325	AI1 input point 1 setting	0~100%	0
f326	AI1 input point 1 frequency	0.0~400.0 Hz	0.0
f327	AI1 input point 2 setting	0~100%	100
f328	AI1 input point 2 frequency	0.0~400.0 Hz	50.0
f329	AI2 input point 1 setting	0~100%	0
f330	AI2 input point 1 frequency	0.0~400.0 Hz	0.0
f331	AI2 input point 2 setting	0~100%	100
f332	AI2 input point 2 frequency	0.0~400.0 Hz	50.0

These parameters adjust the output frequency according to the externally applied analog signal (0-5Vdc voltage, 0-10Vdc voltage, 4-20mAdc current) and the entered command for setting an external contact frequency, see figure 5.11.

Note 1: Do not set the same value to f325 and f327 (or f329 and f331), otherwise a-05 will alarmed.

Note 2: when adjust 4-20mAdc current input, set 20(%) to f325 (f327).



Figre 5.11 Relation between analog input and frequency setting

NO.	Parameter Name	Setting Range	Default

f333	AI1 input bias	0~255	varies by model
f334	AI1 input gain	0~255	varies by model
f335	AI2 input bias	0~255	varies by model
f336	AI2 input gain	0~255	varies by model

To fine adjust the frequency command characteristics for AI1/AI2 input, use the Parameters f333 to f336.

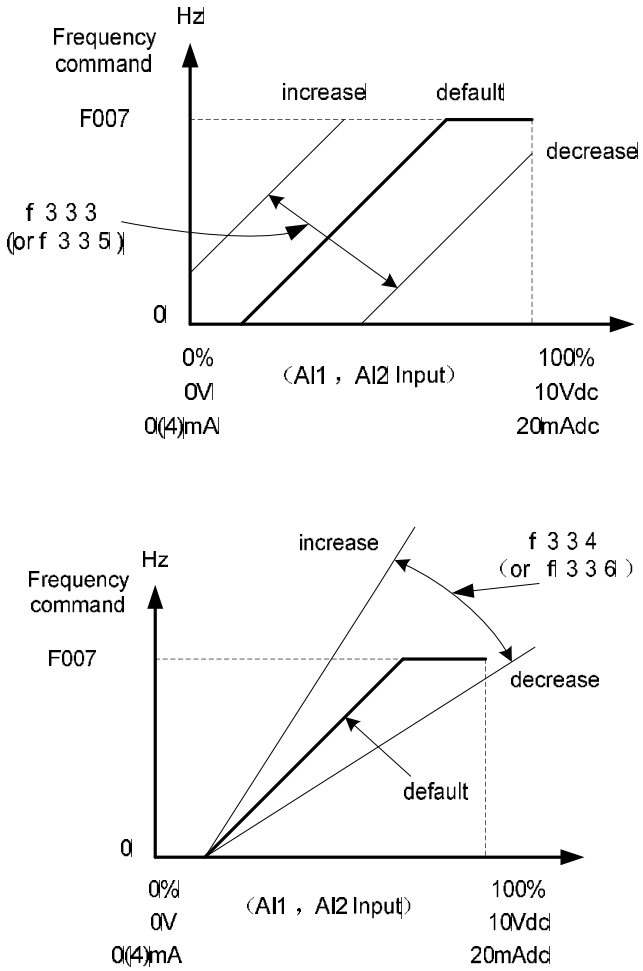


Figure 5.12 Calibration of analog input

Note 1: If you want to reduce the leeway, set f470 or f472 to a larger value. Note that specifying a too large value may cause an output frequency to be output, even though the operation frequency is 0 (zero) Hz.

Note 2: If you want to adjust the inverter so that it will output the maximum frequency at the maximum voltage and current input, set f471 or f473 to a smaller value. Note that specifying a too small value may cause the operation frequency not to reach the maximum frequency, even though the maximum voltage and current input are applied.

NO.	Parameter Name	Setting Range	Default
f337	Low-speed signal output frequency	0.0 Hz ~f007	0.0

When the output frequency exceeds the setting of f337, an ON signal will be generated. This signal can be used as an electromagnetic brake excitation/release signal.

This signal can also be used as an operation signal when f337 is set to 0.0Hz, because an ON signal is put out if the output frequency exceeds 0.0Hz.

If the inverter is so set, the signal will be put out through the open collector OUT(LO-CLO) and RELAY output terminals.

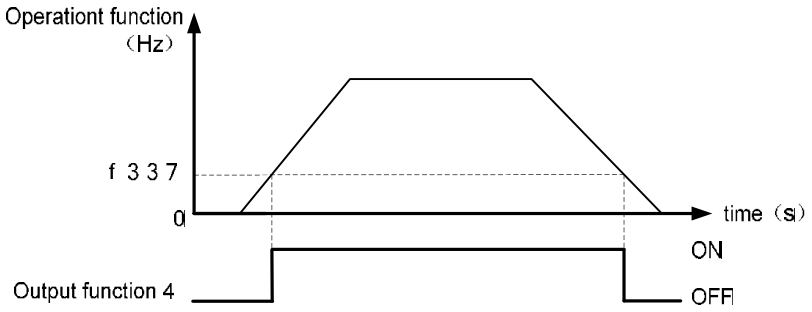


Figure 5.13 Description of Low-speed signal output frequency

NO.	Parameter Name	Setting Range	Default
f338	Speed reach detection output frequency	0.0 Hz ~f007	0.0
f339	Speed reach detection band	0.0 Hz ~f007	2.5

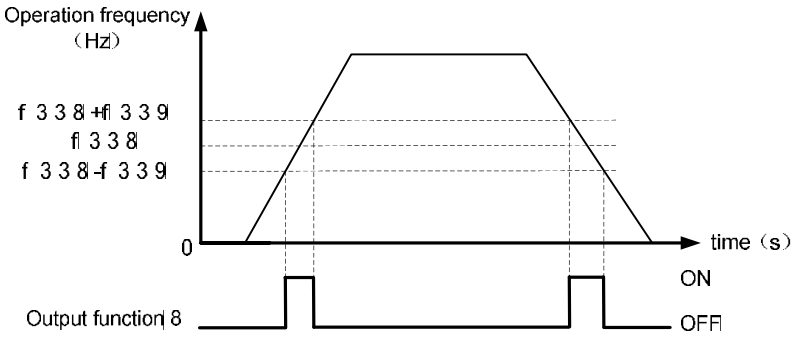


Figure 5.14 Description of Speed reach detection output frequency

NO.	Parameter Name	Setting Range	Default
f340	AI1 input reach detection level	0~100 %	0
f341	AI1 input reach detection band	0~20 %	3

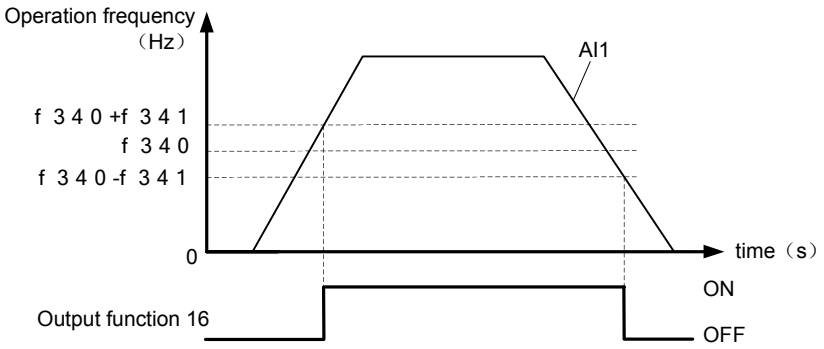


Figure 5.15 Description of AI1 input reach output

NO.	Parameter Name	Setting Range	Default
f342	AI2 input reach detection level	0~100 %	0

f343	AI2 input reach detection band	0~20 %	3

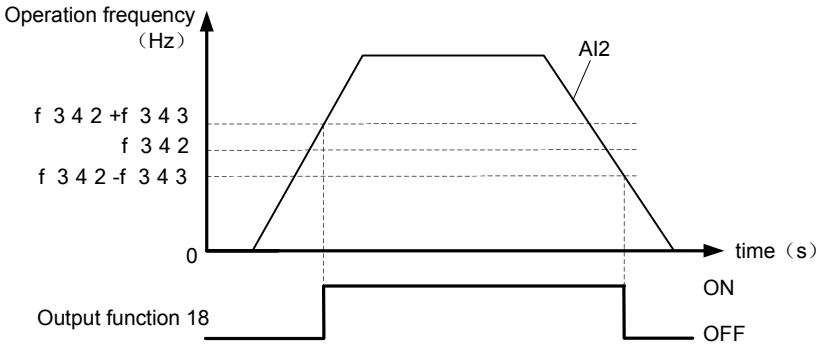


Figure 5.16 Description of AI2 input reach output

NO.	Parameter Name	Setting Range	Default
f344	Frequency command agreement detection range	0.0 Hz ~f007	2.5

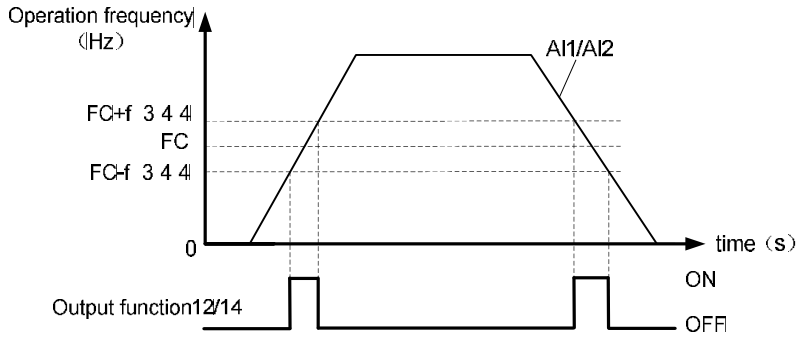


Figure 5.17 Description Frequency command agreement detection output

If the frequency command value specified using f003 (or f005) almost agrees with the frequency command value from the VA and VIB terminal with an accuracy of ± f344, an ON or OFF signal will be sent out.

Note: This function can be used, for example, to send out a signal indicating whether the amount of processing and the amount of feedback agree with each other when the PID function is in use. For an explanation of the PID function.

NO.	Parameter Name	Setting Range	Default
f345	Logic output/pulse train output selection (LO-CLO)	0~1	0

0: Logic output

1: Pulse train output

NO.	Parameter Name	Setting Range	Default
f346	Pulse train output function selection (LO -CLO)	0~14	0

Table5.4 Pulse train output function selection

f346	Description	Reference of max. value
0	Output frequency	f007
1	Output current	150% of inverter rated current
2	Set frequency (Before PID)	f007
3	Frequency setting value (After PID)	f007

4	DC voltage	150% of inverter rated voltage
5	Output voltage command value	150% of inverter rated voltage
6	Input power	185% of inverter capacity
7	Output power	185% of inverter capacity
8	AI1 Input value	5V /10V/20mA
9	AI2 Input value	10V
10	Torque	250% of motor rated torque
11	Torque current	250% of motor rated torque current
12	Motor cumulative load factor	100%
13	Inverter cumulative load factor	100%
14	PBR (braking reactor) cumulative load factor	100%

Note : When item of f346 reachs “Reference of max. value”, the number of pulse train set by f346 are sent to output terminals (LO-CLO).

NO.	Parameter Name	Setting Range	Default
f347	Maximum numbers of pulse train	500~1600	800

Note: The ON pulse width is maintained constant. The ON pulse width is fixed at a width that causes the duty to reach 50% at the maximum pulse number set with f347. Therefore, the duty is variable. For example, the ON pulse width is approximately 0.6 ms when f347 = 800, approximately 0.5ms when f347=1000, or approximately 0.3 ms when f347 = 1600.

NO.	Parameter Name	Setting Range	Default
f348	AO1 selection	0~16	0

The signal of internal calculated value can output from the AO1 terminal. Analog voltage output signal is default. Switching to 0-20mAdc (4-20mAdc) output current can be made by setting f307 to 0.

Table 5.5 AO selection parameters

f348	description	maximum value
0	Output frequency	Maximum frequency f007
1	Output current	150% of invter rated current
2	Set frequency (betore PID)	Maximum frequency f007
3	Frequency setting value (after PID)	Maximum frequency f007
4	DC voltage	150% of inverter rated voltage
5	Output voltage command value	150% of inverter rated voltage
6	Input power	185% of inverter rated voltage
7	Output power	185% of inverter rated voltage
8	AI1 input	(1023)
9	AI2 input	(1023)
10	Torque	250% of inverter rated torque

11	Torque current	250% of inverter rated torque current
12	Motor cumulative load factor	100%
13	Inverter cumulative load factor	100%
14	brake resistor cumulative load factor	100%
15	Serial communication data	——
16	For adjustments (f349 set value is displayed.)	——

NO.	Parameter Name	Setting Range	Default
f349	AO gain adjustment	1~1280	varies by model
f350	Inclination characteristic of analog output	0~1	1
f351	Bias of analog output	0~100%	0

The analog output charicteristic can be adjusted by using the parameter f349, f350 and f351, see figure 5.18.

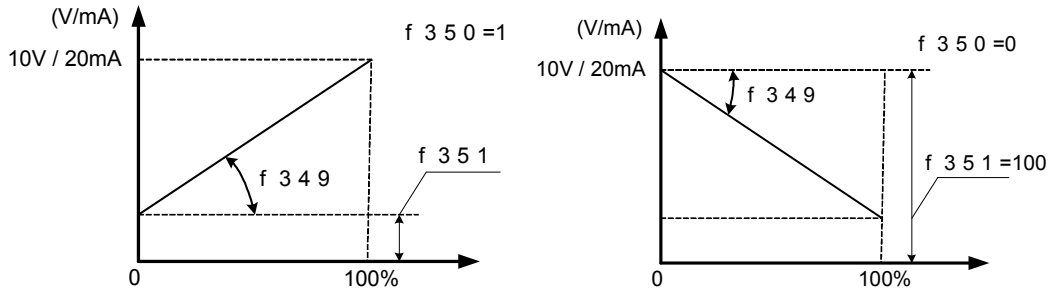


Figure 5.18 Description of f349, f350 and f351

Defaulet output signals from AO1 terminals are analog voltage signals. Their standard setting range is from 0 to 10Vdc. Using these parameters, you can calibrate the output to 4-20mAdc or 20-4mAdc.

Note 1: To switch to 0-20mAdc (4-20mAdc) output, set f307 = 0.

Note 2: Only when f348 = 16, set value of f349 displays.

Note 3: When enters f349. operation frequency is displayed (f348 = 0), then press the ▲ key or the ▼ key to adust f349. If a meter is connected to AO1, the meter reading will change at this time (f349 will change too) but be careful because there will be no change in the inverter's digital LED (monitor) indication.

NO.	Parameter Name	Setting Range	Default
f352	output frequency when AO1 = 0V	0 Hz ~f007	0.0
f353	output frequency when AO1 = 10V	0 Hz ~f007	0.0

Figure 5.19 Description of f352andf353setting

Note: When f348 is set to 0 (or 2,3), if f352 or f353 are not set to 0 at same time, f350 和 f351 will not be effective..

NO.	Parameter Name	Setting Range	Default
f354	AO1 bias	0~255	128

This parameter is factory reserved, do not adjust it.

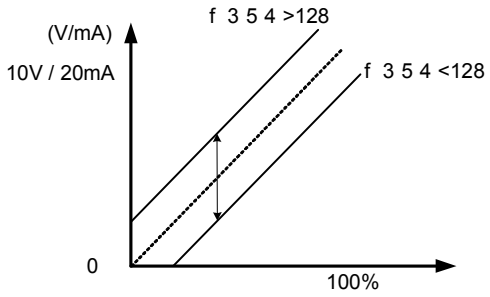


Figure 5.20 Description of f354

NO.	Parameter Name	Setting Range	Default
f355	Input terminal function for LI5	0~69	0
f356	Input terminal function for LI6	0~69	0
f357	Input terminal function for LI7	0~69	0
f358	Input terminal function for LI8	0~69	0

The set method is same as f301~f304.

Note1: Only valid when capacity rating is at 15kw or above.

NO.	Parameter Name	Setting Range	Default
f359	Output terminal function A of T2	0~255	0
f360	Output terminal function B of T2	0~255	0
f361	Output terminal logic selection of T2	0~1	0
f362	T2 output delay	0~60.0s	0.0

The set method is same as f315.

Note1: Only valid when capacity rating is at 15kw or above.

NO.	Parameter Name	Setting Range	Default
f363	Input terminal active mode	0~1	0

0: Input terminal function active when input terminal is OFF.

1: Input terminal function inactive when input terminal is ON.

NO.	Parameter Name	Setting Range	Default
f364	Input terminal filter time	0~200	0

1 is equelance about 2ms。

NO.	Parameter Name	Setting Range	Default
f365	Output terminal function B of T1	0~ 69	0

The set method is same as f315.

NO.	Parameter Name	Setting Range	Default
f366	Output terminal logic selection of T1	0~1	0

The set method is same as f316.

NO.	Parameter Name	Setting Range	Default
f367	Termianl run detection selection at power on	0~1	0

0：Disable, when power on，Inverter will not supply to the motor even if the input terminal (to which forward/reverse run function is assigned) is ON, Only open the input terminal and re-close it will start the motor.

1：Enable. when power on，Inverter will supply to the motor on the detection of the forward/reverse run terminal is ON.

5.5 Fault protection parameter group

NO.	Parameter Name	Setting Range	Default
f400	Retry selection (Selecting the number of times)	0~10	0

0: disabled

1~10 times.

This parameter resets the inverter automatically when the inverter gives an alarm. During the retry mode, the motor speed search function operated automatically as required and thus allows smooth motor restarting.

Protective operation detection relay signals (T1A-T1B-T1C or T2A-T2B-T2C terminal signals) are not sent during use of the retry function.

To allow a signal to be sent to the protective action detection relay (TxA, B and C terminals) even during the retry process, assign the output terminal function 36 or 37 to f315.

A virtual cooling time is provided for overload tripping (e-21, e-22). In this case, the retry function will operate after the virtual cooling time and retry time.

In the event of tripping caused by an overvoltage (e-11), the retry function will not be activated until the voltage in the DC section comes down to a normal level.

In the event of tripping caused by overheating (e-24), the retry function will not be activated until the temperature in the inverter comes down low enough for it to restart operation.

Keep in mind that when f429 is set to 1 (trip retained), the retry function will not be performed, regardless of the setting of f400.

During retrying, the blinking display will alternate between a-08 and the monitor display specified by status monitor display mode selection parameter f610.

The number of retries will be cleared if the inverter is not tripped for the specified period of time after a successful retry. "A successful retry" means that the inverter output frequency reaches the command frequency without causing the inverter to re-trip.

Retry available fault including overcurrent (e-01, e-04), overvoltage (e-11), overheat (e-24), over load(e-21, e-22), and momentary power failure.

The retry function will be canceled at once if tripping is caused by an unusual event other than the retry available fault. This function will also be canceled if retrying is not successful within the specified number of times.

“Function be canceled” means inverter will be tripped and stop supply to motor.

The interval time is proportional relation with retry times. The first retry is 1sec, the second retry is 2 sec and the 10^{th} retry is 10sec.

retry time	1	2	3	4	5	6	7	8	9	10
success time	1s	2s	3s	4s	5s	6s	7s	8s	9s	10s

Before all fault reset attempts are finished:
The output terminal to which output terminal function 40 (or 41) is assigned will not indicate the fault.
The output terminal to which output terminal function 38 (or 39) is assigned can be used to indicate the appearance of automatically retry available fault.
The output terminal to which output terminal function 30 (or 31) is assigned can be used to indicate any type of the fault in the inverter even if during the the period of retry.

NO.	Parameter Name	Setting Range	Default
f401	Electronic-thermal protection characteristic selection	0~7	2

Table 5.6 Description of f401

f401	motor type	overload tripped enable	overload stall
0	Standard motor	YES	NO
1		YES	YES
2		NO	NO
3		NO	YES
4	Special motor (forced cooling)	YES	NO
5		YES	YES
6		NO	NO
7		NO	YES

Overload stall: This is an optimum function for equipment such as fans, pumps and blowers with variable torque characteristics that the load current decreases as the operating speed decreases. When the inverter detects an overload, this function automatically lowers the output frequency before the motor overload trip e-21 is activated. This function operates a motor at frequencies that allow the load current to keep its balance so that the inverter can continue operation without being tripped.

Note: Do not use the overload stall function with loads having constant torque characteristics (such as conveyor belts in which load current is fixed with no relation to speed).

NO.	Parameter Name	Setting Range	Default
f402	Motor 150%-overload time limit	10~2400s	300

Parameter f403 is used to set the time elapsed before the motor trips under a load of 150% (overload trip e-22) within a range of 10 to 2400 seconds.

NO.	Parameter Name	Setting Range	Default

f403	Emergency stop selection	0~2	0
f404	emergency braking time	0~20.0 s	1.0

0: Coast stop

1: Slowdown stop

2: Emergency DC braking

These parameters allow you to specify how to stop operation using an external control device when an external trip occurs. When operation stopped, the trip e-43 displayed. When setting f403 =2 (emergency DC braking), set also f507 (DC braking rate) and f404 (emergency braking time). Assigning the trip stop function (input terminal function 11 or 27) to the contact input terminal.

Note 1: Emergency stopping via the specified terminal is possible, even during panel operation.

Note 2) If DC braking is not needed to bring the motor to a stop under normal conditions, although f403 is set to 2 (emergency DC braking), set the DC braking starting frequency (f506) at 0.0 Hz.

NO.	Parameter Name	Setting Range	Default
f405	Input phase failure detection	0~1	0

0: Disabled, No tripping.

1: Enabled, Phase failure detection is enabled during operation.

This parameter detects inverter input Phase failure. If the abnormal voltage status of main circuit capacitor persists for few minutes or more, the tripping function will be activated.

Therefore, input phase failures cannot always be detected. A trip information e-41 will be displayed. If the power capacity is larger than the inverter capacity (more than 200kVA or more than 10 times), detection errors may occur. If this actually happens, install an AC or DC reactor.

Note1: Setting f405 = 0(input phase failure detection: disabled) may result in a breakage of the capacitor in the inverter main circuit if operation is continued under a heavy load in spite of the occurrence of an input phase failure.

Note2: Parameter f405 is invalid for single-phase input model.

NO.	Parameter Name	Setting Range	Default
f406	Output phase failure detection mode selection	0~5	0

0: Disabled.

1: At start-up (Only one time after power is turned on).

2: At start-up (each time).

3: During operation.

4: At start-up and during operation.

5: Detection of cutoff on output side.

f406=0: No tripping.

f406=1: With the power on, the phase failure detection is enabled only at the start of the first operation. The inverter will trip if the Phase failure status persists for one second or more.

f406=2: The inverter checks for output phase failures each time it starts operation. The inverter will trip if the Phase failure status persists for one second or more.

f406=3: The inverter checks for output phase failures during operation. The inverter will trip if the Phase failure status persists for one second or more.

f406=4: The inverter checks for output phase failures at the start of and during operation. The inverter will trip if the Phase failure status persists for one second or more.

f406=5: If it detects an all-phase failure, it will restart on completion of reconnection. The inverter does not check for output phase failures when restarting after a momentary power failure.

Note1: A check for output phase failures is made during auto-tuning, regardless of the setting of this parameter.

Note2: Set f406=5 to open the motor-inverter connection by switching commercial power operation to inverter operation. Detection errors may occur for special motors such as high-speed motors.

NO.	Parameter Name	Setting Range	Default
f407	Small current trip/alarm selection	0~1	0

0: Alarm only. A small current alarm can be put out by setting the output terminal function selection parameter.

1: Tripping. The inverter will trip if a current below the current set with f408 flows for the period of time specified with f410. Trip information is displayed as "e-06".

NO.	Parameter Name	Setting Range	Default
f408	Small current detection current	0~100%	0.00
f409	Small current detection current hysteresis	1~20%	10
f410	Small current detection time	0~255s	0

If a current smaller than the f408 specified value flows for more than the f410 specified time. When tripping is selected (see f407), enter the detection time to tripping. Trip information is displayed as "e-12". See figure 5.21.

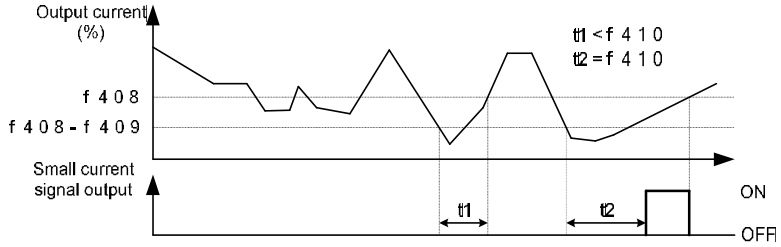


Figure 5.21 Description of small current

Note: The 100% standard value of f408 and f409 is the rated output current indicated on the motor nameplate.

NO.	Parameter Name	Setting Range	Default
f411	Over-torque trip/alarm selection	0~1	0

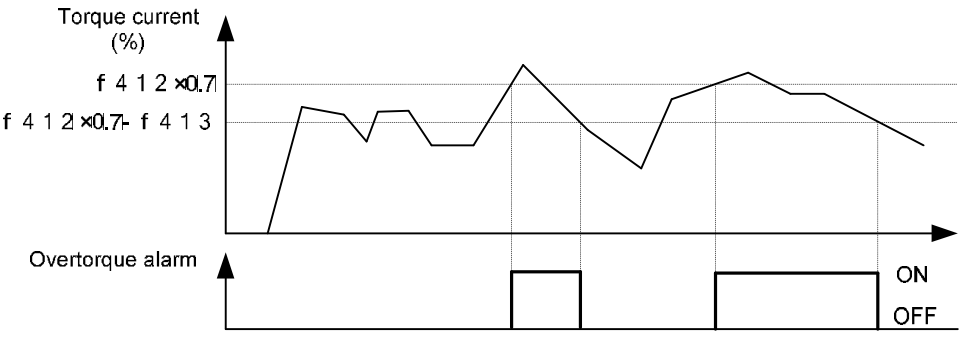
0: Alarm only. A overtorque alarm can be put out by setting the output terminal function selection parameter.

1: Tripping. The inverter will trip if a torque currrent exceeding the f412 specified level flows for the period of time specified with f414. Trip information is displayed as "e-07".

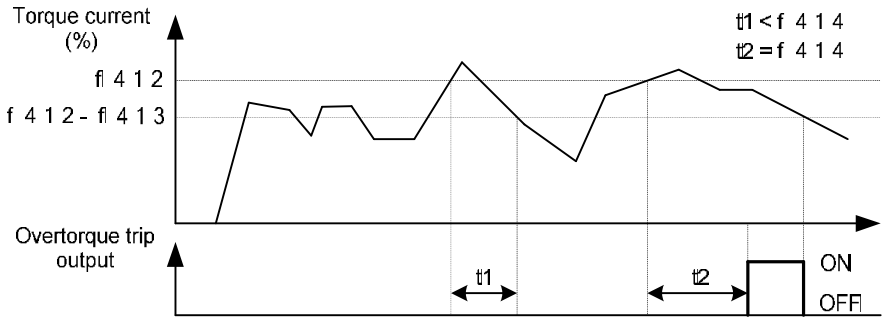
NO.	Parameter Name	Setting Range	Default

f412	Over-torque detection level	0~250%	130
f413	Over-torque detection level hysteresis	0~100%	10
f414	Over-torque detection time	0.0~10.0s	0.5

Use the f411 parameter to trip the inverter or to output the alarm if a torque currrent exceeding the f412-specified level flows for more than the f414-specified time. Trip information is displayed as "e-07".



a) Over-torque detection alarm output



b) Over-torque detection trip output

Figure 5.22 Description of Over-torque detection

Note 1: Output over-torque detection alarm by assigning the output terminal function 48 to T1 (T2 or LO-CLO). Output over-torque detection trip by assigning the output terminal function 32 to T1 (T2 or LO-CLO).

Note 2: The 100% standard value of f412 and f413 is the rated output current indicated on the motor nameplate.

NO.	Parameter Name	Setting Range	Default
f415	Overvoltage limit operation	0~3	2

0: Enabled. When the inverter detects the upcoming overvoltage fault, it takes one of the following measures to avoid overvoltage: to increase deceleration time, to keep motor speed or raise motor speed.

1: Disabled

2: Enabled (Quick deceleration). The inverter will increase the voltage to the motor (over-excitation control) to increase the amount of energy consumed by the motor when the voltage reaches the overvoltage protection level, and therefore the motor can be decelerated more quickly than normal deceleration.

3: Enabled (Dynamic quick deceleration). the inverter will increase the voltage to the motor(over-excitation control) to increase the amount of energy consumed by the motor as soon as the motor begins to slow down, and therefore the motor can be decelerated still more quickly than quick deceleration.

Note: When motor speed falls, the inverter absorbs regenerative energy from the load and the motor. This often brings DC bus overvoltage fault. If f415 is set to 3, this portion of engery will not be fed back to the inverter, but converted to heat dissipation into the motor. In this case the motor intensely gives out heat.

NO.	Parameter Name	Setting Range	Default
f416	Overvoltage limit operation level	100~150%	130

f416 specifies the Overvoltage limit operation level.

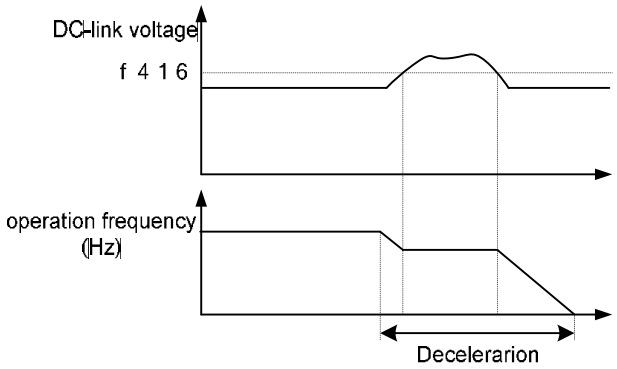


Figure5.23 Description of overvoltage limit operation level

NO.	Parameter Name	Setting Range	Default
f417	Undervoltage trip/alarm selection	0~2	0

0: Alarm only (detection level below 60%), The inverter is stopped. However, it is not tripped.

1: Tripping (detection level below 60%). Inverter is stopped. It is also tripped

2: Alarm only (detection level below 50%, input reactor needed)

NO.	Parameter Name	Setting Range	Default
f418	Instantaneous power failure coast stop selection	0~2	0

0: disabled

1: factory reserved

2: Coast stop.

Coast stop in the event of momentary power failure: If a momentary power failure occurs during operation, the inverter coast stops forcibly. When operation is stopped, the message “a-06” is displayed (alternately) on the keypad. After the forced coast stop, the inverter remains static until you put off the operation command momentarily.

NO.	Parameter Name	Setting Range	Default
f419	Forced fire-speed control function	0~1	0

0: Disabled.

1: Enabled.

To enable forced speed mode, set f419 to 1,and allocate input terminal function 33 to a input contact terminal. If f419 is set to 1 and intput terminal function 33 is ON, the inverter will run at the frequency set by f730. At this time,

Put OFF the input terminal function 33 will not stop the inverter.

The following inverter trip will not make it stop, but automatic restart is performed.: e-01 , e-04, e-11 , e-21, e-22, e-23, e-24.

When the inverter is under local running mode, the inverter can only be stopped by powering off.

Note 1: The motor running direction is forward and the inverter runs according to the frequency command of the setpoint of f730.

Note 2: The following operations will not make the inverter or motor stop: disabling function 33, press STOP key or light trip occurs.

NO.	Parameter Name	Setting Range	Default
f420	Detection of output short-circuit during start-up	0~3	0

0: Each time (standard pulse)

1: Only one time after power is turned on (standard pulse)

2: Each time (short-time pulse)

3: Only one time after power is turned on (short-time pulse)

Note 1: when the phase resistor of the motor is small (motor capacity is large, short-time pulse is recommended.

NO.	Parameter Name	Setting Range	Default
f421	Motor electric-thermal protection retention selection	0~1	0

0: disabled. If the inverter is turned on and off, its motor thermal state memory (used for overload computation) will be cleared.

1: Enabled. Even if the inverter is turned off, the motor thermal state memory of the inverter is still retained. If motor overload fault e-22 occurs in the inverter, the motor can be restarted only after a period of cooling time (computed by the inverter).

NO.	Parameter Name	Setting Range	Default
f422	AI1 input loss	0~100%	0

0: Disabled. The inverter will not monitor the signal state on the analog input terminal AI1.

1~100: Fault detection level. If signal on AI1 drops below the selected fault detection level and this low signal level lasts 300 ms or more, fault occurs in the inverer. The keyboard panel will display fault code e-38.

NO.	Parameter Name	Setting Range	Default
f423	Activation of the inverter during 4-20mA signal loss	0~4	0

0: No measures.

1: Coast stop.

2: switch to Fallback speed. To switch to fallback speed f424. The duration is as long as the fault life time and the running command is still valid.

3: Speed maintaining. To maintain the speed at the time when fault occurs in the inverter. The duration is as long as the fault life time and the running command is still valid.

4: Slowdown stop.

NO.	Parameter Name	Setting Range	Default
f424	Fallback speed	0.0 Hz ~f004	0.0

See f423 = 2.

NO.	Parameter Name	Setting Range	Default
f425	PTC thermal selection	0~2	0

0: Disabled

1: Enabled (trip mode), If the PTC probe triggers the signal of fault, the inverter enters into fault state and displays “e-25”.

2: Enabled (alarm mode), if the PTC probe triggers the signal of fault, the inverter will trigger fault signal and continues running.

This function is used to protect motor from overheating using the signal of PTC built-in motor.Setting f425 to 1 or 2 can convert control terminal AI2 to a PTC motor thermal probe input. The wiring is shown in the following figure.

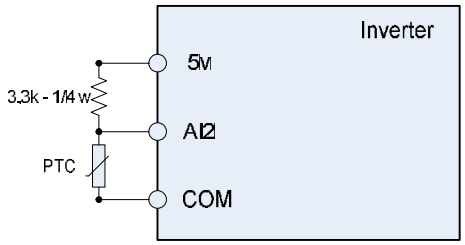


Figure 5.24 PTC wiring example

Note: PTC resistance must be connected in from AI2 terminal. One 3.3k-1/4 W resistance must be externally connected between 5 V and AI2.

NO.	Parameter Name	Setting Range	Default
f426	Resistor value for PTC detection	100~9999 Ω	3000

NO.	Parameter Name	Setting Range	Default
f428	Cumulative operation time alarm setting	0.0~999.9	610.0

This parameter allows you to set the inverter so that it will put out an alarm signal (Output terminal function = 50) after a lapse of the cumulative operation time set with f428.

Note: 0.1=10h.

NO.	Parameter Name	Setting Range	Default
f429	Inverter trip retention selection	0~1	0

0: Clearing. The fault occurs and after the inverter is turned off and on,

If the fault cause has been eliminated, the inveter will be reset and can be started.

The information of just eliminated fault will be transmitted to the fault history record.

If the fault cause has not been eliminated yet, the fault will be displayed again and the running information related to the fault will be transmitted to the fault history record.

The information of the 4th from last fault will be eliminated from the fault history record.

1: Maintaining. The fault occurs and after the inverter is turned off and on,

If the fault cause has been eliminated, the inveter will be reset and can be started. The information of just eliminated fault will be transmitted to the fault history record.

If the fault cause has not been eliminated yet, original fault codes and all running data can be inquired as current fault under monitoring mode.

The information of the 4th from last fault will be reserved in the fault history record.

Automatic fault reset will be disabled.

5.6 Fault protection parameter group

NO.	Parameter Name	Setting Range	Default
f500	Auto-restart control selection	0~4	0

0: Disabled

1: At auto-restart after momentary stop

2: When turning standby (input terminal function =1) on or off

3: At auto-restart or when turning standby (input terminal function =1) on or off

4: At start-up

The f500 parameter detects the rotating speed and rotational direction of the motor during coasting ing the event of momentary power failure, and then after power has been restored, restarts the motor smoothly (motor speed search function).

This parameter also allows commercial power operation to be switched to inverter operation without stopping the motor. During operation, "a-08" is displayed. During the retry mode see f400), the motor speed search function operated automatically as required and thus allows smooth motor restarting.

At restart, it takes about 300 ms for the inverter to check to see the number of revolutions of the motor. For this reason, the start-up takes more time than usual. Use this function when operating a system with one motor connected to one inverter. This function may not operate properly in a system configuration with multiple motors connected to one inverter.

Setting f500 =1, (3): This function operates after power has been restored following detection of an undervoltage by the main circuits and control power.

Setting f500 =2, (3): This function operates after the standby terminal((input terminal function =1) connection has been opened first and then connected again.

Setting f500 =4, a motor speed search is performed each time operation is started.This function is useful especially when the motor is not operated by the inverter but it is running because of external force.

Setting f500 = 0 (Disabled) and disabling the retry function (f400=0), when apply the inverter to crane or hoist. Such machines may have its load moved downward during the above waiting time from input of the operation starting command to the restart of the motor.

NO.	Parameter Name	Setting Range	Default
f501	auto-stop time limit for lower-limit frequency operation	0.0~600.0s	0.1

0: disabled（0.0）. None.

1: Enabled（0.1~600.0s）. If operation is carried out continuously at a frequency below the lower-limit frequency (f009) for the period of time set with f501, the inverter will enter into sleep mod and automatically slow down the motor to a stop. At that time, “a-10” is displayed (alternately) on the keypad. This function will be canceled if a frequency command above the lower-limit frequency (f009) +0.2Hz.

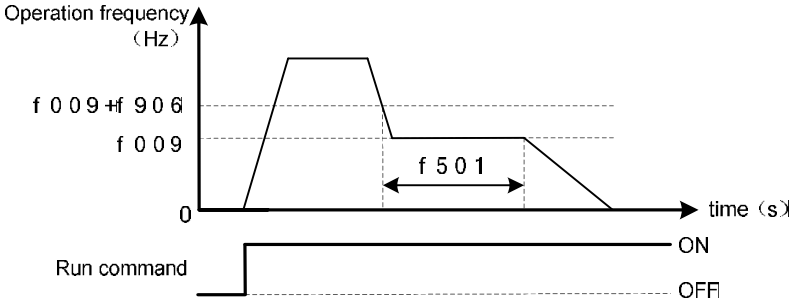


Figure 5.25 Description of sleep mode

Note: This function is enabled even at the start of operation and during switching between forward and reverse run.

NO.	Parameter Name	Setting Range	Default
f502	Bumpless operation selection	0~1	1

0: disabled.

1: enabled.

When switching from remote mode to local mode using f601, the status of start and stop, and operating frequency at remote mode are moved to local mode.By contraries, when switching from local mode to remote mode, they are not moved to remote mode.

Table 5.7 f502 desctiption

f502 setting	switching between remote mode and local mode	description
0	Remote → Local	motor stops
	Local → Remote	run immediately with run command and frequency setting under remote control.
1	Remote → Local	motor runs continuesly with original run command and frequency setting under remote control.
	Local → Remote	run immediately with run command and frequency setting under remote control.

E.g, when f601=1, the inverter runs at 20 Hz of frequency setting under remote control mode. If switched to local mode (make f713=0), the inverter continues to run at 20 Hz under local control mode.

NO.	Parameter Name	Setting Range	Default
f503	Starting frequency setting	0.5~10.0Hz	0.5

The frequency set with f503 is put out as soon as operation is started. Use the f503 parameter when a delay in response of starting torque according to the acceleration/deceleration time is probably affecting operation. Setting the starting frequency to a value from 0.5 to 3Hz is recommended (f503 is usually set to the motor rated slip frequency). The occurrence of an overcurrent can be suppressed by setting this frequency below the rated slippage of the motor.

Rated slip frequency can be calculated with the parameters written on the nameplate of the motor:

$f_s = f_0 - \frac{n_N * P}{60}$.

P——pole pairs. n_N——motor rated speed (rpm) .

f_0——base frequency (Hz) . f_s——motor rated slip frequency (Hz) .

NO.	Parameter Name	Setting Range	Default
f504	Operation starting frequency	0.0 Hz ~f007	0.0
f505	Operation starting frequency hysteresis	0.0 Hz ~f007	0.0

The Run/stop of operation can be controlled simply with these two parameters.The inverter begins accelerating after the frequency setting signal has reached point B. Deceleration ends when the frequency setting signal decreases below point A.

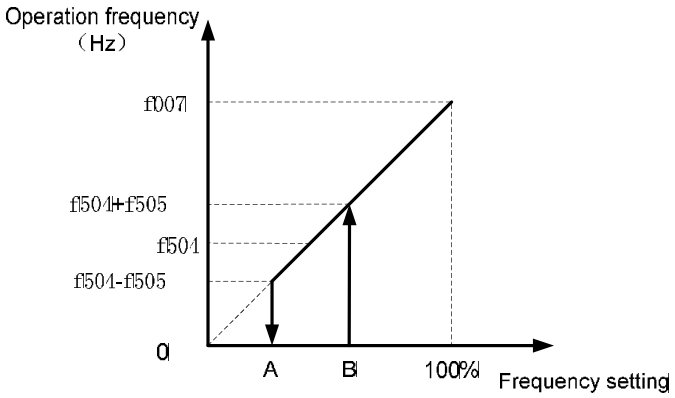


Figure 5.26 Description of Operation starting frequency

NO.	Parameter Name	Setting Range	Default
f506	DC braking starting frequency	0.0 Hz ~f007	0.0
f507	DC braking current	varies by model	varies by model
f508	DC braking time	0.0~20.0 s	1.0

A large braking torque can be obtained by applying a direct current to the motor. These parameters set the direct current to be applied to the motor, the application time and the starting frequency. During DC braking, a-07 displays.

DC braking can be activated by two methods as follows:

Auto matically DC braking: when operation frequency decreases below f506, DC braking is activated.

Input terminal signal: when the input terminal function 13 is ON, DC braking is activated.

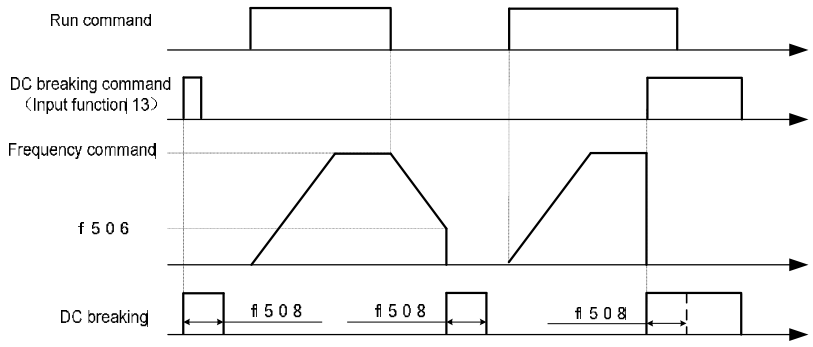


Figure 5.27 DC braking sequence

Note1: During DC braking, the overload protection sensitivity of the inverter increases. The DC braking current may be adjusted automatically to prevent tripping.

Note 2: During DC braking, the carrier frequency is 6 kHz or less irrespective of the setting of parameter f012 (PWM carrier frequency).

NO.	Parameter Name	Setting Range	Default
f510	Acceleration/deceleration 1 pattern	0~2	0

0: Linear, This pattern can usually be used.

1: S-pattern 1, Select this pattern to accelerate/decelerate the motor rapidly to a high-speed region with an output frequency of 50Hz or more or to minimize the shocks applied during acceleration/deceleration. This pattern is suitable for pneumatic transport machines.

2: S-pattern 2, Select this pattern to obtain slow acceleration in a demagnetizing region with a small motor acceleration torque. This pattern is suitable for high-speed spindle operation.

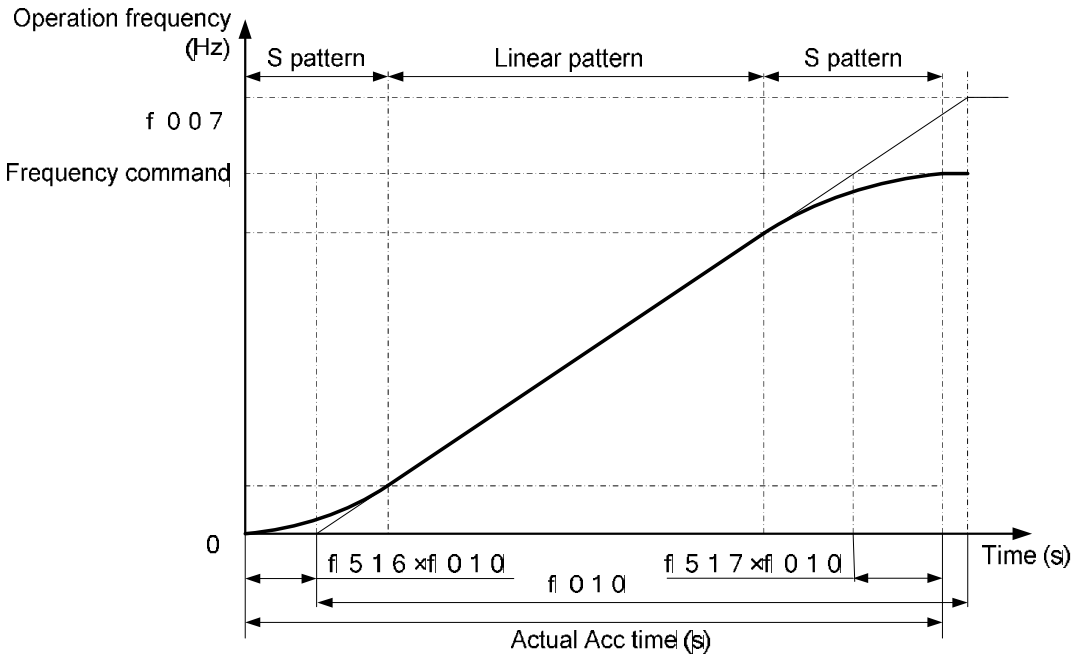


Figure 5.28 S-pattern acceleration/deceleration 1

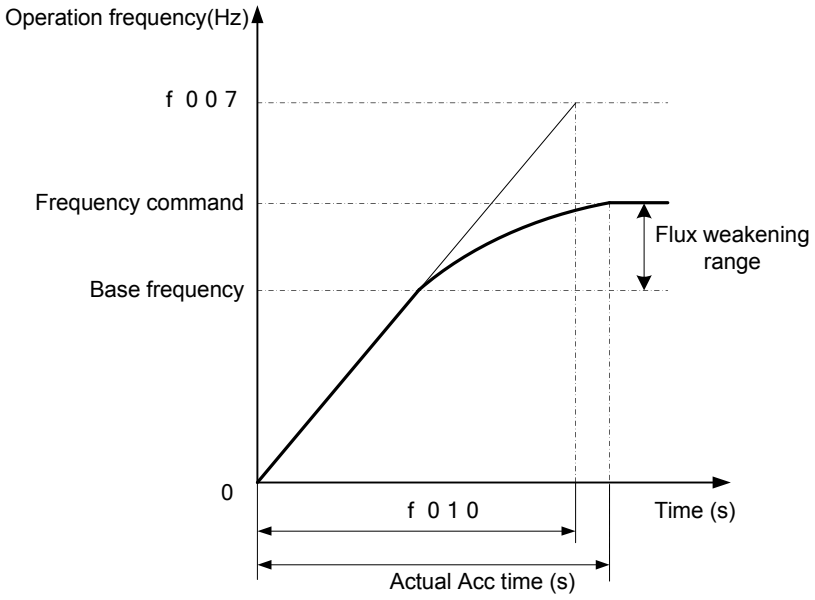
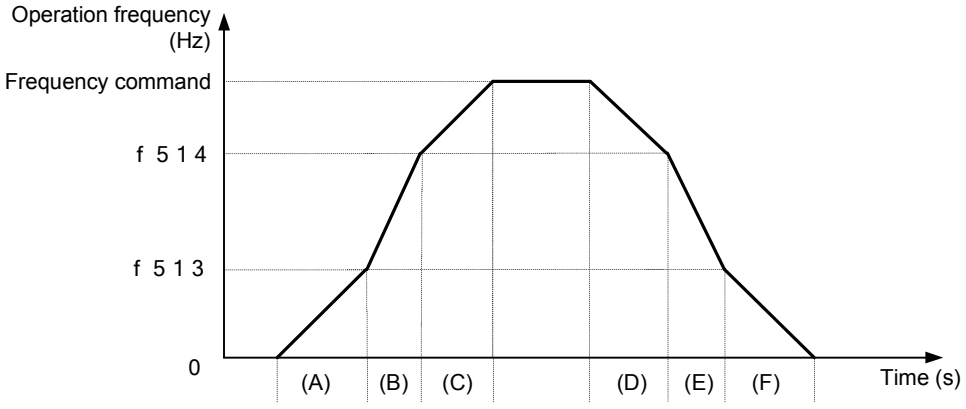


Figure 5.29 S-pattern acceleration/deceleration 2

NO.	Parameter Name	Setting Range	Default
f511	Acceleration/deceleration 2 pattern	0~2	0
f512	Acceleration/deceleration 3 pattern	0~2	0

NO.	Parameter Name	Setting Range	Default
f513	Acceleration/deceleration 1 and 2 switching frequency	0.0 Hz ~f008	0.0
f514	Acceleration/deceleration 2 and 3 switching frequency	0.0 Hz ~f008	0.0



Figere 5.30 Acc/Dec parameters switching automatically

When set f513≠0 and the inverter output frequency increases above (or decreases below) f513 setting, f518(or f519) is effective.

Note:

(A) and (F) according to Acc/Dec 1 ; (B) and (E) according to Acc/Dec 2 ; (C) and (D) according to Acc/Dec 3.

NO.	Parameter Name	Setting Range	Default
f515	Selecting an acceleration/deceleration pattern	1~3	1

1: Acc/Dec 1, f010 , f011 and f510 are valid.

2: Acc/Dec 2, f518 , f519 and f511 are valid.

3: Acc/Dec 3, f520 , f521 and f012 are valid.

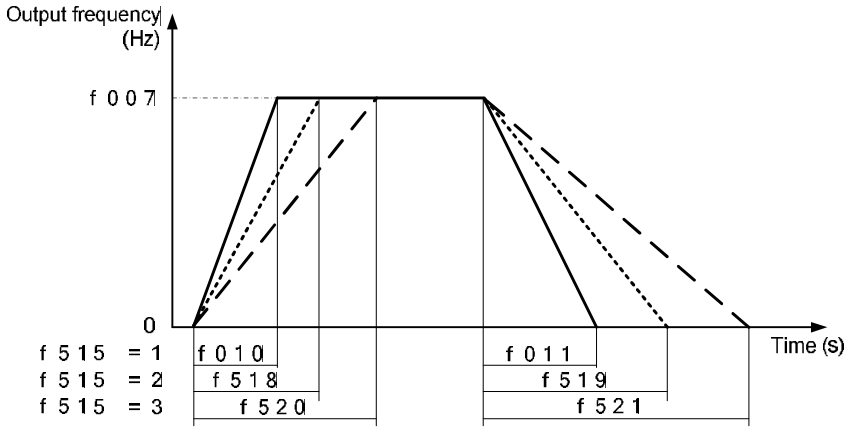


Figure 5.30 Acc/Dec parameters description

NO.	Parameter Name	Setting Range	Default
f516	S-pattern lower-limit adjustment amount	0~50 %	10
f517	S-pattern upper-limit adjustment amount	0~50 %	10

f516 and f517 are used to adjust the relative proportion of the upper arc and lower arc of the S curve against the complete acceleration/deceleration time.

NO.	Parameter Name	Setting Range	Default
f518	Acceleration time 2	0.0~3200s	20.0
f519	Deceleration time 2	0.0~3200s	20.0
f520	Acceleration time 3	0.0~3200s	20.0
f521	Deceleration time 3	0.0~3200s	20.0

Three acceleration times and three deceleration times can be specified individually. A method of selection or switching can be selected from among the following:

1) Selection by means of parameters, see f515

2) Switching by changing frequencies, see f513、f514

3) Switching by means of terminals, see input terminal function 5, 64.

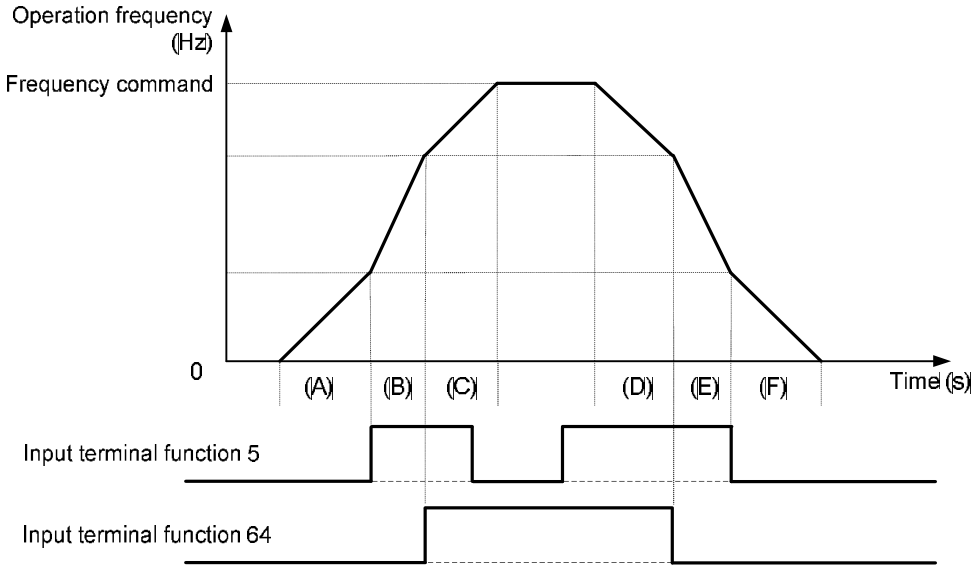


Figure 5.31 Using input contact terminal select Acc/Dec

Tabel 5.8 Using input contact terminal select Acc/Dec

input terminal function 64	input terminal function 5	Acc/Dec selection
0	0	Acc/Dec1
0	1	Acc/Dec 2
1	0	Acc/Dec 3
1	1	Acc/Dec 3

Tabel 5.9 Using input contact terminal and switching frequency select Acc/Dec

Frequency command	nput terminal function 5	input terminal function 64	Acc/Dec selection
Fc =< f513	0	0	ACC1
	1	0	ACC2
	0	1	ACC1
	1	1	ACC2
f513 < Fc =< f514	0	0	ACC2
	1	0	ACC1
	0	1	ACC2
	1	1	ACC1
f514 < Fc	0	0	ACC3
	1	0	ACC3
	0	1	ACC3
	1	1	ACC3

Note:

(A) and (F) according to Acc/Dec 1 ; (B) and (E) according to Acc/Dec 2 ; (C) and (D) according to Acc/Dec 3.

NO.	Parameter Name	Setting Range	Default
f522	Reverse-run prohibition	0~2	0

0: Forward/reverse run permitted.

1: Reverse run prohibited.

2: Forward run prohibited.

NO.	Parameter Name	Setting Range	Default
f523	stop pattern	0~1	0

0: Panel slowdown stop. when stop command is from panel.

1: Panel coast stop. when stop command is from panel.

2: Terminal coast stop. when stop command is from iput terminal.

NO.	Parameter Name	Setting Range	Default
f527	regenerative braking selection	0~2	2

0: Disabled

1: Enabled (with resistor overload protection)

2: Enabled (without resistor overload protection)

Connect an external braking resistor in the following cases to enable dynamic braking function:

1) When decelerating the motor abruptly or if overvoltage tripping (e-11) occurs during deceleration stop.

2) When a continuous regenerative status occurs during downward movement of a lift or the winding-out operation of a tension control machine.

3) When the load fluctuates and a continuous regenerative status results even during constant speed operation of a machine such as a press.

Note 1: To connect a dynamic braking resistor, set the overvoltage limit operation parameter f415 = 1(Disabled).

NO.	Parameter Name	Setting Range	Default
f528	regenerative braking resistance	1.0~1000.0 Ω	20.0
f529	regenerative braking resistor capacity	0.01~30.0 kw	0.12

5.7Keyboard panel parameter group

NO.	Parameter Name	Setting Range	Default
f600	Prohibition of panel reset operation	0~1	0

0: Permitted

1: Prohibited

This parameter can prohibited/ permitted the reset operation by <STOP> key.

NO.	Parameter Name	Setting Range	Default
f601	Switching between remote control and Local control	0~1	1

0: Local control mode, Start and stop, and frequency setting are effective only by keypad keys. f002~f005 is invalid.

1: remote control mode, Start and stop, and frequency setting follow the selection of f002 , f003.

NO.	Parameter Name	Setting Range	Default
f602	Prohibition of change of parameter setting	0~1	0

0: Permitted

1: Prohibited

NO.	Parameter Name	Setting Range	Default
f603	Current/voltage display mode	0~1	1

0: %, display in percentage terms.

1: A (ampere)/V (volt), display in amperes/volts.

These parameters are used to change the unit of monitor display. Like current monitor and Voltage monitor

display. (% ⇔ A (ampere)/V (volt))

Note1: f603 converts the following parameter settings: Motor electronic-thermal protection level 1 and 2 (f106, f110), DC braking current (f507), Stall prevention level 1 and 2 (f107, f111), Small current detection current (f408).

Note2: Base frequency voltage 1 and 2 (f102, f109) always displayed in the unit of V.

NO.	Parameter Name	Setting Range	Default
f604	Frequency free unit magnification	0.00~200.0	0.00

0.00: Free unit display disabled (display of frequency).

0.01-200.0: Value displayed = actual frequency [×] f604.

e.g., output frequency = 50Hz, if f604=30.0, Value displayed on the panel is 1500.

Note: This parameter displays the inverter output frequency as the value obtained by multiplying it by a positive number. This does not mean that the actual motor speed or line speed is indicated with accuracy.

NO.	Parameter Name	Setting Range	Default
f605	Factory reserved	0~1	0

NO.	Parameter Name	Setting Range	Default
f606	Inclination characteristic of free unit display	0~1	1

0: Negative inclination (downward slope)

1: Positive inclination (upward slope)

NO.	Parameter Name	Setting Range	Default
f607	Bias of free unit display	0.00Hz ~f007	0.00

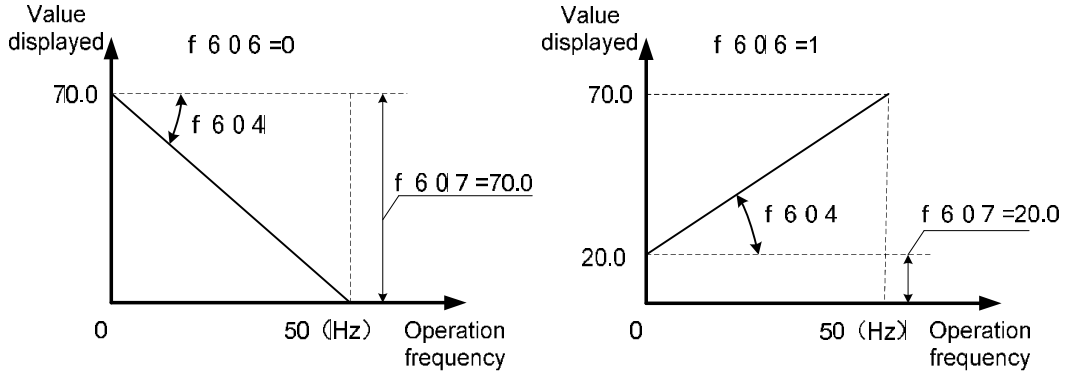


Figure 5.32 Description of freeunit

If f604 is not set as 0.00, value displayed is obtained as follows:

- When f606=0, value displayed =f604x (f607 – actual frequency value)
- When f606=1, value displayed =f604x (f607 + actual frequency value)

NO.	Parameter Name	Setting Range	Default
f608	Free step 1 (pressing a panel key once)	0.00 Hz ~f007	0.00

0.00: disabled.

0.01~f007: enabled.

Under normal conditions, the frequency command value from the keypad increases in steps of 0.1 Hz each time you press the ▲ key.

If f608 is not 0.00, the frequency command value will increase by the value with f608 each time you press the ▲ key. Similarly, it will decrease by the value set with f608 each time you press the ▼ key. In this case, the output frequency displayed in standard monitor mode changes in steps of 0.1 Hz, as usual.

The frequency (F000) set on the keypad changes in steps of 10.0 Hz: 0.0 → 20.0 → ... 50.0 (Hz), each time you press the ▲ key. This function comes in very handy when operating the load at limited frequencies that change in steps of 1Hz, 5Hz, 10Hz, and so on

NO.	Parameter Name	Setting Range	Default
f609	Free step 2 (panel display)	0~255	0

0: disabled.

1~255: enabled.

When f608 is not 0.00, and f609 is not 0 (disabled):

Output frequency displayed in standard monitor mode = Internal output frequency × f609÷f608.

Example: When f608 =1.00 (Hz), and f609 =1: Each time you press the ▲ key, the frequency setting changes in steps of 1Hz: 0→ 1 → 2 → ... → 50(Hz) and also the value displayed on the keypad changes in steps of 1. Use these settings to hide decimal fractions and also the value displayed on the keypad changes in steps of 1. Use these settings to hide decimal fractions.

The settings of f609 and f608 have no effect when the free unit selection (f604) is enabled.

NO.	Parameter Name	Setting Range	Default
f610	Standard monitor display selection	0~10	0

0: Output frequency(Hz(free))

1: Frequency command(Hz(free))

2:Output current(%/A)

3:Inverter rated current (A)

4:Inverter load (%)

5:Output power (kW)

6: Stator frequency (Hz (free))

7:communication data display

8: Output speed

9: Communication counter

10: Normal communication counter

Note: When the power is on, the standard monitor mode displays the operation frequency (default setting) in the format of "0.0". This format can be changed to any other monitor display format by setting f610.

NO.	Parameter Name	Setting Range	Default
f611	Panel running order clear selection	0~1	1

0: Clear（when standby terminal OFF）.

1: Keep（when standby terminal OFF）.

Note 1: When f611=0, Put OFF the standby terminal (see input function 1) will stop the motor..

NO.	Parameter Name	Setting Range	Default
f612	Panel operation prohibition (F000)	0~1	0

0: Permitted

1: Prohibited

This parameter can prohibited/permitted set panel operation frequency(f000) by key ▲and ▼.

NO.	Parameter Name	Setting Range	Default
f613	Prohibition of panel operation (RUN/STOP keys)	0~1	0

0: Permitted.

1: Prohibition.

NO.	Parameter Name	Setting Range	Default
f614	Prohibition of panel emergency stop operation	0~1	0

0: Permitted.

1: Prohibition.

NO.	Parameter Name	Setting Range	Default
f616	Integral output power retention selection	0~1	1

0: (clear), with the main power off, not retention of integral output power values.

1: (memory), with the main power off, retention of integral output power values.

NO.	Parameter Name	Setting Range	Default
f617	Integral output power display unit selection	0~3	varies by model

0: 1kWh.

1: 10kWh.

2: 100kWh.

3: 1000kWh.

NO.	Parameter Name	Setting Range	Default
f618	Search and resetting of changed parameters selection	0~1	0

0: Disable. Not display “-uf-" parameter group.

1: Enable. Display “-uf-" parameter group.

Users can automatically searches for those parameters that are programmed with values different from the standard default setting and displays them in the “-uf-" parameter group. Parameter setting can also be changed within this group.

NO.	Parameter Name	Setting Range	Default
f619	Factory reserved		
f620	Factory reserved		
f621	Factory reserved		
f622	Factory reserved		
f623	Factory reserved		

5.8 Additional function parameter group

NO.	Parameter Name	Setting Range	Default
f700	Panel JOG mode selection	0~1	0

0: disable JOG key.

1: enable JOG key.

This mode allows you to jog the motor by controlling the operation from the keypad. This mode is hidden by default.

When under the standard monitor mode, pressing the key JOG will move the inverter to jog mode and displays jogor-jog. Press ▲ or ▼ to change jog direction.

NO.	Parameter Name	Setting Range	Default
f701	jog run frequency	0.0~20.0	5.0

NO.	Parameter Name	Setting Range	Default
f702	Jog stopping pattern	0~2	0

0: Slow down stop.

1: coast stop.

2: DC braking.

Use the jog run parameters to operate the motor in jog mode. Input of a jog run signal fenerates a jog run frequency output at once, irrespective of the designated acceleration time.

NO.	Parameter Name	Setting Range	Default
f703	Jump frequency 1	0.0 Hz ~f007	0.0
f704	Jumping width 1	0.0~30.0 Hz	0.0
f705	Jump frequency 2	0.0 Hz ~f007	0.0
f706	Jumping width 2	0.0~30.0 Hz	0.0
f707	Jump frequency 3	0.0 Hz ~f007	0.0
f708	Jumping width 3	0.0~30.0 Hz	0.0

Resonance due to the natural frequency of the mechanical system can be avoided by jumping the resonant frequency during operation. During jumping, hysteresis characteristics with respect to the jump frequency are given to the motor.

Do not set the jump parameters, if multiple jump frequency setting width overlapped.

During acceleration or deceleration, the jumping function is disabled for the operation frequency.

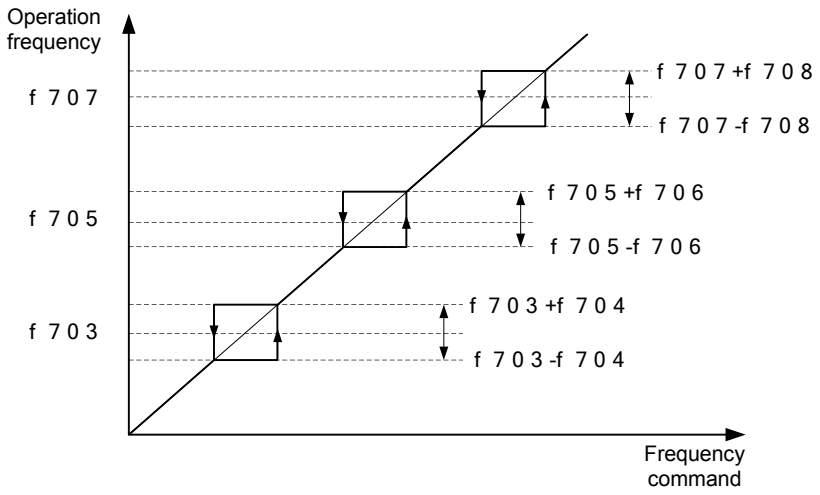


Figure 5.33 Description of jump frequency

NO.	Parameter Name	Setting Range	Default
f709	Braking mode selection	0 ~3	0

0: OFF.

1: Forward direction.

2: Reverse direction.

3: Same direction of run.

NO.	Parameter Name	Setting Range	Default
f710	Release frequency	0.0~20.0 Hz	3.0
f711	Release time	0.0 ~25.0s	0.5
f712	Creeping frequency	0.0~20.0 Hz	3.0
f713	Creeping time	0.0 ~25.0s	1.0

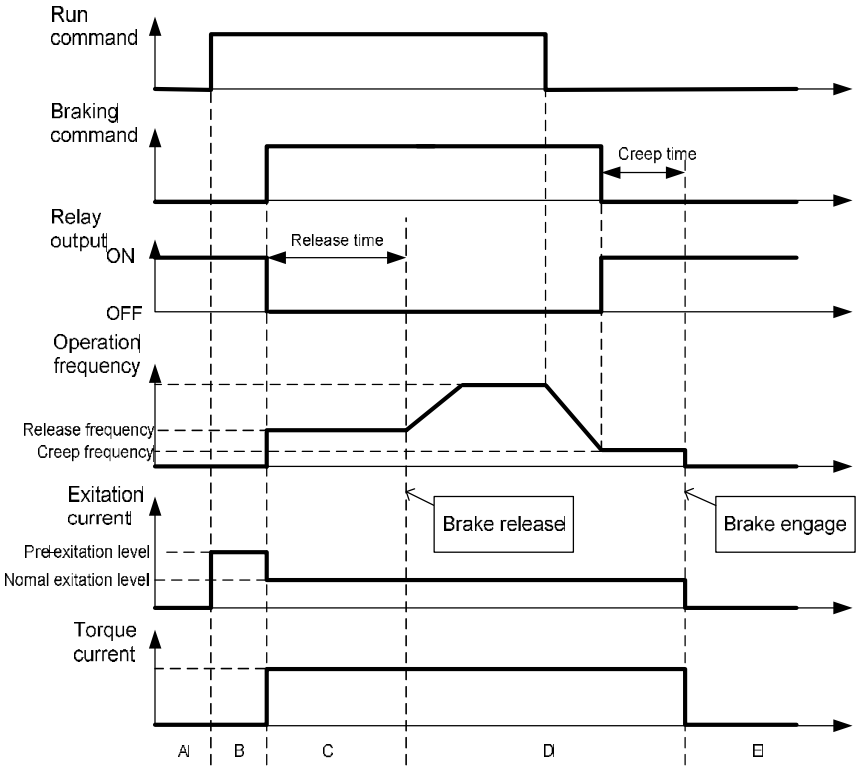


Figure 5.34 Description of braking mode sequency

NO.	Parameter Name	Setting Range	Default
f714	Droop gain	0~100%	0
f715	Droop insensitive torque band	0~100%	10

The droop control function refers to the function of operating the power-running motor at operating frequency f1 (Hz) that is lower than command frequency f0 (Hz) by droop frequency Δf (Hz) when the torque current is T1 (%).The droop frequency Δf can be calculated, using the following expression.

Droop frequency Δf (Hz)= F101 × f714× (Torque current T1 – f715)

When the torque current is above the specified droop insensitive torque band (f715), the frequency is reduced during power running or increased during regenerative braking.

The above figure shows an example of the operating frequency during power running. During regenerative braking, control is performed in such a way as to increase the frequency.

The droop function is activated above the torque current set with f715.

The amount of droop frequency Δf varies depending on the amount of torque current T1.

Note: If the base frequency exceeds 100Hz, count it as 100Hz. Control is exercised between the starting frequency (f503) and the maximum frequency (f007).

[An example of calculation]

Parameter setting:Base frequency f101=60 (Hz), droop gain f714=10 (%)

Droop insensitive torque band f715=30 (%)

Droop frequency Δf (Hz) and operating frequency f1 when command frequency f0 is 50 (Hz) and torque current T1 is 100 (%) are as follows.

Droop frequency Δf (Hz)=vl × f714 × (T1 – f715)

=60 (Hz) × 10 (%) × (100 (%) - 30 (%))

=4.2 (Hz)

Operation frequency f1 (Hz) = f0 - Δf = 50 (Hz) - 4.2 (Hz)=45.8 (Hz)

NO.	Parameter Name	Setting Range	Default
f716	Preset-speed 1	f009~f008	3.0
f717	Preset-speed 2	f009~f008	6.0
f718	Preset-speed 3	f009~f008	9.0
f719	Preset-speed 4	f009~f008	12.0
f720	Preset-speed 5	f009~f008	15.0
f721	Preset-speed 6	f009~f008	18.0
f722	Preset-speed 7	f009~f008	21.0
f723	Preset-speed 8	f009~f008	24.0
f724	Preset-speed 9	f009~f008	27.0
f725	Preset-speed 10	f009~f008	30.0
f726	Preset-speed 11	f009~f008	33.0
f727	Preset-speed 12	f009~f008	36.0
f728	Preset-speed 13	f009~f008	39.0
f729	Preset-speed 14	f009~f008	45.0
f730	Preset-speed 15	f009~f008	50.0

A maximum of 15 speed steps can be selected just by switching an external contact signal. Multi-speed frequencies can be programmed anywhere from the lower limit frequency f009 to the upper limit frequency f008. Use the input terminal function selection to allocate “Preset-speed command 1” to “Preset-speed command 4” terminal. For more information, see table 5.8.

.

Table 5.8 Relation between Preset-speed command and Preset-speed

Setting Frequency	Preset-speed command 4	Preset-speed command 3	Preset-speed command 2	Preset-speed command 1
preset-speed commands are invalid	0	0	0	0
Preset-speed 1	0	0	0	1
Preset-speed 2	0	0	1	0

Preset-speed 3	0	0	1	1
Preset-speed 4	0	1	0	0
Preset-speed 5	0	1	0	1
Preset-speed 6	0	1	1	0
Preset-speed 7	0	1	1	1
Preset-speed 8	1	0	0	0
Preset-speed 9	1	0	0	1
Preset-speed 10	1	0	1	0
Preset-speed 11	1	0	1	1
Preset-speed 12	1	1	0	0
Preset-speed 13	1	1	0	1
Preset-speed 14	1	1	1	0
Preset-speed 15	1	1	1	1

NO.	Parameter Name	Setting Range	Default
f731	Factory reserved		
f732	Factory reserved		
f733	Factory reserved		
f734	Factory reserved		
f735	Factory reserved		
f736	Factory reserved		
f737	Factory reserved		
f738	Factory reserved		

5.9 Communication function parameter group

NO.	Parameter Name	Setting Range	Default
f800	Modbus baud rate	0~1	1

0: 9600 bps.

1: 19200 bps.

2: 4800 bps.

3: 2400 bps.

4: 1200 bps.

NO.	Parameter Name	Setting Range	Default
f801	Modbus parity	0~2	1

0: NONE, datum format : < 8, N, 2 >.

1: EVEN, datum format :< 8, E, 2 >.

2: ODD, datum format :< 8, O, 2 >.

NO.	Parameter Name	Setting Range	Default
f802	Modbus address	0~247	1

NO.	Parameter Name	Setting Range	Default
f803	Modbus timeout	0~100	0

0: timeout check disabled.

1-100: 1=1s.

NO.	Parameter Name	Setting Range	Default
f804	Modbus transger waiting time	0~2.00s	0.00

NO.	Parameter Name	Setting Range	Default
f805	Modbus behaviour on communication fault	0~4	4

0: Inverter stop, communication command, frequency mode open(by F002, F003)

1: None (continued operation)

2: Deceleration stop

3: Coast stop

4: Communication error (e-33 trip) or Network error (e-35 trip)

NO.	Parameter Name	Setting Range	Default
f806	Number of motor poles for communication	1~8	2

NO.	Parameter Name	Setting Range	Default
f821	Factory reserved		
f822	Factory reserved		
f823	Factory reserved		
f824	Factory reserved		
f825	Factory reserved		
f826	Factory reserved		
f827	Factory reserved		
f828	Factory reserved		
f829	Factory reserved		

NO.	Parameter Name	Setting Range	Default
f830	PID setting of keypad	0~100%	0.0

f830=100% can make the sensor output the maximum value.

The 100% standard value of f830 is the measurement range of sensor. If the measurement range of pressure sensor is 0.0~1.6Mpa for example, set f830 =100% means that pressure setting is 1.6Mpa.

Note 1: When f900=0, f830 is not effective.

5.10Process PID parameter group

PID control is a common used method in process control, such as flow, pressure and temperature control.

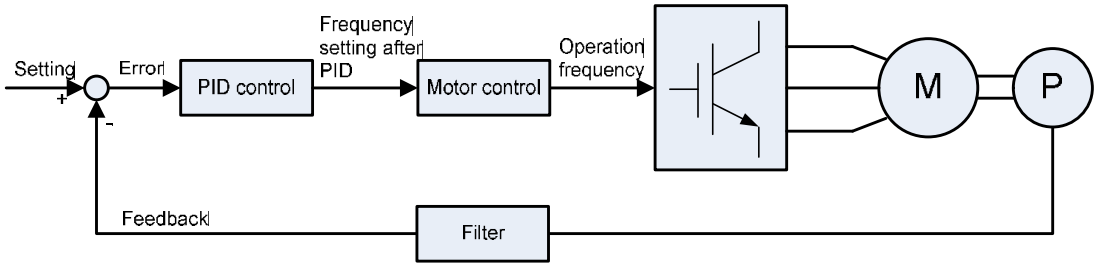


Figure 5.35 Block diagram of PID process control

f900~f916 define built-in process PID control function parameters of the inverter. The block diagram of process PID control function is shown as below:

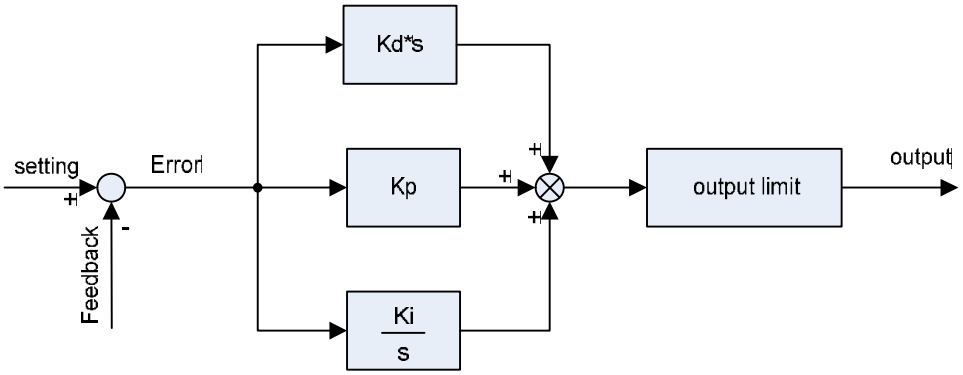


Figure 5.36 Block diagram of built-in PID controller

NO.	Parameter Name	Setting Range	Default
f900	PID control	0~2	0

0: Disabled,

1: Enabled (Feedback: AI1)

2: Enabled (Feedback: AI2)

Note: Do not set the same value to f003 and f900.

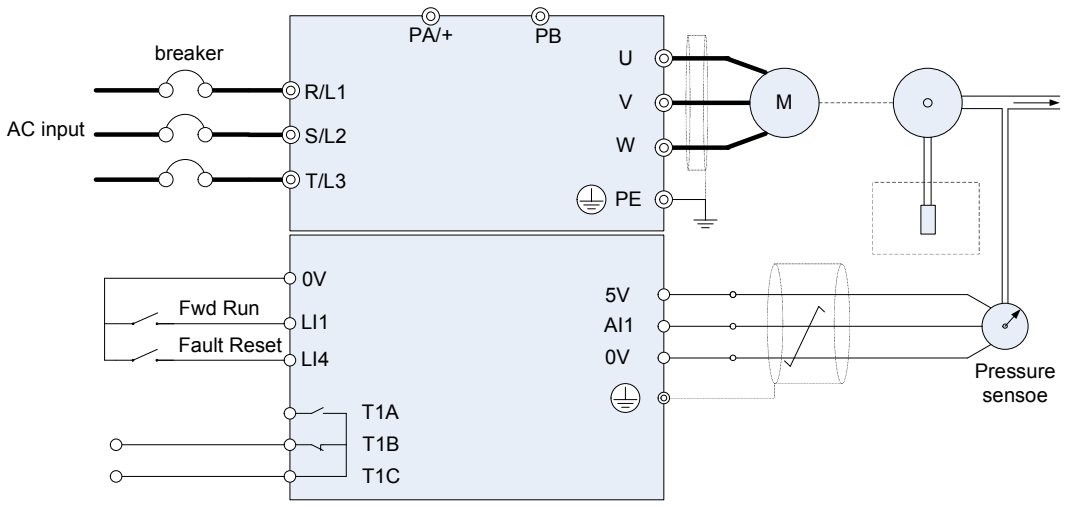


Figure 5.37 PID wiring example

Process quantity input data (frequency or percentage term) and feedback input data can be combined as follows for the PID control. See table 5.9.

Table 5.9 PID setting and PID feedback

Process quantity input data		Feedback input data
f003 (f005) setting	setting method	f900 setting
0	built-in potentionmeter	f900=1: AI1, 0~5VDC or 0~10V DC or 4~20mA DC. f900=2: AI2, 0~10V DC.
1	AI1	
2	AI2	
3	Keypad (frequency)	
4	Serial communication	
5	UP/DOWN from external contact	
6	-	
7	Keypad (percentage term) (see f830)	
- (when under remote control, f002=0)	Multistep speed setting	

NO.	Parameter Name	Setting Range	Default
f901	Proportional gain	0.01~100.0	varies by model
f902	Integral gain	0.01~100.0	varies by model
f903	Differential gain	0.00~2.55	0.00

The control effect of f901: The greater the setpoint is, the smaller the deviation between target value and feedback value after stability is. However, excessively large setpoint may arouse vibration in the controlled object and make it unstable. Furthermore, if the setpoint is small, the deviation between target value and feedback value after stability becomes greater.

The control effect of f902: Any residual deviation after proportional gain tuning can be cleared with time through integral gain function. Higher integral gain can realize rapid response to process deviation, but may result in unstability such as oscillation.

The control effect of f903: Differential gain will tune the response time of the inverter according to the rapid change during the process. Unnecessary raise of of differential gain value may result in greater fluctuation of the motor speed and make the system unstable.

NO.	Parameter Name	Setting Range	Default
f904	PID control waiting time	0~2400s	0

When f904 is set to value > 0 s, the inverter will not enter into PID control immediately after started. During the time set by f904, the inverter will ignore the feedback signal and accelerate the motor to the speed set by the input setting.

NO.	Parameter Name	Setting Range	Default
f905	PID regulator diviation input signal negation	0~1	0

0: Disabled.

1: Enabled.

Note: PID regulator negation is performed in two ways: Make f905=1, or define logic input function as 38 and the corresponding terminal is closed.

NO.	Parameter Name	Setting Range	Default
f906	Sleep mode awakening hysteresis bandwidth	0.0 Hz ~ f007	0.2

Under the sleeping mode, the inverter will re-accelerate the motor to the given frequency once it detects frequency command > f009+f906. See f501.

NO.	Parameter Name	Setting Range	Default
f907	Sleeping mode awakening threshold based on PI deviation	0.0 Hz ~f007	0.0

Under the sleeping mode, the inverter will re-accelerate the motor to the given frequency once it detects the error between PID setting and PID feedback > f907.

NO.	Parameter Name	Setting Range	Default
f908	Sleeping mode awakening threshold based on PI feedback	0.0 Hz ~f007	0.0

Under the sleeping mode, the inverter will re-accelerate the motor to the given frequency once it detects the PID feedback > f908（when f905=0）.

NO.	Parameter Name	Setting Range	Default
f909	sleeping mode action	0~1	0

0: Motor slowdown to a stop.

1: Motor keep running at the speed setting by f009.

NO.	Parameter Name	Setting Range	Default
f910	wake up delay	0~600.0s	0.0

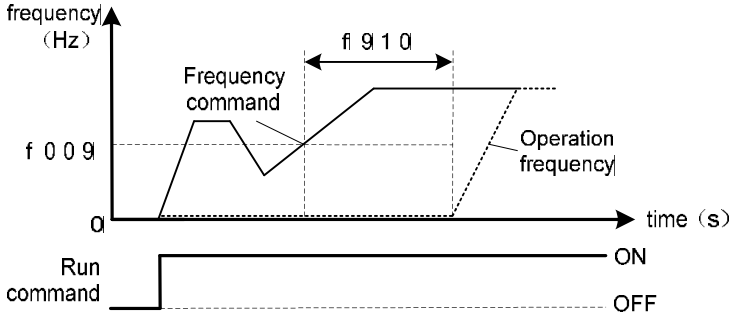


Figure 5.38 description of wake up from sleep mode

NO.	Parameter Name	Setting Range	Default
f911	Auto wake up level	0~100.0%	0.0

When feedback detected value is smaller than f911 setting, inverter wake up from sleep mode.

NO.	Parameter Name	Setting Range	Default
f912	Auto sleep level	0~100%	0.0

When feedback detected value is bigger than f912 setting, inverter enter into sleep mode and stop the motor.

NO.	Parameter Name	Setting Range	Default
f913	Upper limit of PID setting	0~100%	100
f914	Lower limit of PID setting	0~100%	0

f913 and f914 set the upper and lower limit frequency that determines PID setting.

NO.	Parameter Name	Setting Range	Default
f915	auto-stop time limit for lower-limit frequency operation	0~600.0	0.1

See f501. Note: f915 and f501 are the same parameter internally.

NO.	Parameter Name	Setting Range	Default
f916	PID setting of keypad	0~100%	0

See f830.

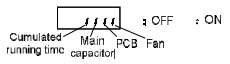
Note: f916 and f830 are the same parameter internally.

5.11 Monitoring function parameter group

Table 5.10 Status monitor mode

NO.	Parameter Name	Description
u000	CPU1 Version	E.g: v 1 0 0, G-type, v= g; P-type, v= p ;
u001	Operation frequency	Value is displayed in Hz/free unit. See f604.
u002	Direction of rotation	0 Forward run, 1 Reverse run.
u003	frequency command value	Value is displayed in Hz/free unit. See f604.
u004	load current	The inverter output current (%/A) is displayed.
u005	input voltage (AC RMS)	The inverter input voltage (%/V) is displayed.
u006	output voltage (AC RMS)	The inverter output voltage command (%/V) is displayed.
u007	Input terminal status indicated	11kW or below: < < > } : OFF i : ON. (AI1-AI2 LI4 LI3 LI2 LI1) 15kW or above: > > ? > } : OFF i : ON. (LI8 ··· LI3 LI2 LI1)
u008	Output terminal status indicated	: OFF : ON, without T2 at 11kW or below (T2 LO-CLO T1)
u009	cumulative operation	(0.01=1 hour, 1.00=100 hours)

	time	
u010	Output speed	Displays the motor speed (min-1) by calculating with output frequency and pole numbers.
u011	Rated current	The rated current of the inverter (A) is displayed.
u012	Torque current	The torque current (%/A) is displayed.
u013	Load current	The inverter output current (load current) (%/A) is displayed.

NO.	Parameter Name	Description
u014	Torque	The torque (%) is displayed.
u015	Input power	The inverter input power (kW) is displayed.
u016	Output power	The inverter output power (kW) is displayed.
u017	PID feedback	The PID feedback value is displayed. (Hz/free unit)
u018	Frequency command value (PID-computed)	The PID-computed frequency command value is displayed. (Hz/free unit)
u019	Integral input power	The integrated amount of power (kWh) supplied to the inverter is displayed.
u020	Integral output power	The integrated amount of power (kWh) supplied from the inverter is displayed.
u021	Communication counter	Displays the counter numbers of communication through the network.
u022	Normal state communication counter	Displays the counter numbers of communication only at normal state in the all communication through network.
u023	Cpu2 version	v 1 0
u024	Parts replacement alarm information	 ON: Needs to be replaced
u025	Cpu1 revision	
u026	PID setting	Displayed in % term.
u027	PID feedback	Displayed in % term.
u1--	Past trip 1	Enter into the display of detailed information on past trip 1
u2--	Past trip 2	Enter into the display of detailed information on past trip 2
u3--	Past trip 3	Enter into the display of detailed information on past trip 3
u4--	Past trip 4	Enter into the display of detailed information on past trip 4

Note 1: Items displayed can be changed by pressing ▲ or ▼ key in the monitor mode.

Note 2: You can switch between % and A (ampere)/V (volt), using the parameter f604 (current/voltage unit selection).

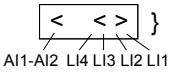
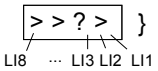
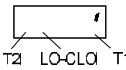
Note 3: The input/output voltage displayed is as large as the AC root-mean-squre input.

Note 4: The integrated amounts of input and output power will be reset to zero, if you press and hold down the ENT key for 3 seconds or more when power is off or when the input terminal function 32 is turned on or displayed.

Note 5: The cumulative operation time increments only when the machine is in operation.

Note 6: At the occurrence of a trip, maximum values are not always recorded and displayed for reasons of detecting time.

Table 5.11 Display of detailed information on past trip n (n=1,2,3,4)

NO.	Parameter Name	Description
-	Cause of trip	E.g. e-01
un00	Continuous trips	The number of time the same trip occurred in succession is displayed. (Unit: times)
un01	CPU1 Version	E.g: v 1 0 0, G-type, v= g; P-type, v= p ;
un02	Operation frequency	Value is displayed in Hz/free unit. See f604.
un03	Direction of rotation	0 Forward run, 1 Reverse run.
un04	frequency command value	Value is displayed in Hz/free unit. See f604.
un05	load current	The inverter output current (%/A) is displayed.
un06	input voltage (AC RMS)	The inverter input voltage (%/V) is displayed.
un07	output voltage (AC RMS)	The inverter output voltage command (%/V) is displayed.
un08	Input terminal status indicated	11kW or below:  : OFF i : ON. 15kW or above:  : OFF i : ON.
un09	Output terminal status indicated	 : OFF ' : ON, without T2 at 11kW or below

Note 1: If no trip occurred in the past, the message “nerr” will be displayed. Detailed information for past trip is not accessed.

Note 2: Details on a past trip can be displayed, even after the inverter is turned off or reset.

6. FAULT DIAGNOSIS AND MEASURES

6.1. Fault code, cause and measures

When fault (failure) occurs, the inverter takes the following actions: The keyboard panel blinks to display the fault code, the inverter stops output and the motor freely stops.

Table 6.1 Fault display and measures

Code of fault	Type of fault	Possible cause	Measures (troubleshooting)
e-01	Overcurrent protection	● Acceleration time is too short. ● V/f parameter is wrongly set. ● When the inverter starts, the load is still in rotation. ● Inverter is supplying power to low-impedance motor. ● Interphase short circuit or earthing failure. ● Abrupt fluctuation of the load	● Increase acceleration parameter (F010 or F618) and the deceleration time (F011 or F519) ● Select the correct setpoint for V/f. ● Adopt forward/reverse speed tracking and restart function (STR function). ● Tune the switching frequency. ● Check wiring to see if there is Interphase short circuit or earthing failure. ● Reduce fluctuation of the load
e-02	Interphase short circuit	● Interphase output is short circuit. ● Motor impedance is too low.	● Confirm the wiring and insulation status.
e-03	Starting overcurrent	● earthing failure ● IGBT unit damage	● Confirm whether the wiring and device are earthing ● Connect with factory
e-04	Earthing fault	● earthing failure ● IGBT unit damage	● Confirm whether the wiring and device are earthing ● Connect with factory

e-06	Underload fault	● Inverter's output current is lower than low current detection threshold.	● Check whether F407~F410 are correctly set.
e-07	Overtorque fault	● The motor estimates that the torque has reached the level set by F412.	● Adjust the settings of F411~F414. ● Confirm the load status.
e-11	Undervoltage fault	● Abnormal fluctuation of input voltage; Power network capacity higher than 200 kVA; There is switchable capacitor to improve power factor on the power network; Machine that SCRs is connected to the power network. ● Inverter starts the load already in rotation. ● There is possible phase failure. ● The deceleration time is too short.	● Install input reactor or use braking resistance. ● Adopt forward/reverse speed tracking and restart function (STR function) (F500 = 1) ● Set F418 = 2. ● Determine the cause of output phase failure (such as poor connection, open circuit of output or open circuit of motor winding) and correct it. ● Increase the deceleration time (F011 or F519) ● Enable overvoltage fault protection (F415).
e-12	DC bus undervoltage fault	● Input voltage is too low.	● Check input voltage. ● Set F417 to select alarm or tripping. ● Adopt forward/reverse speed tracking and restart function (STR function) (F500 = 1) ● Set F418= 2.
		●	●
e-21	Inverter overload	● Acceleration time is too short. ● DC braking current level is too high. ● V/f parameter is wrongly set.	● Increase acceleration parameter (f007 or f617). ● Reduce the setting of f606 and f607. ● Correctly set V/f parameter. ● Set parameter f501 = 2.

		● When the inverter starts, the load is still in rotation. ● The load is too large.	● Use an inverter with higher rated power.
e-22	Motor overload	● V/f parameter is wrongly set. ● The motor is blocked. ● The motor continues to run at low speed. ● The load applied to the motor is too large.	● Correctly set V/f parameter. ● Check the load.
e-23		●	●
e-24	Inverter overheat fault	● Inverter's cooling fan does not work. ● Environment temperature is too high. ● Certain ventilation opening is blocked. ● There is heat source near the inverter.	● Reset the inverter's fault after cooling and restart the inverter. ● Expand the free space around the inverter; Remove all heat sources near the inverter to lower the environment temperature.
e-25	Motor PTC overheating fault	● External PTC embedded in the motor winding indicates existence of motor overheating.	● Correct motor overheating. ● Check whether PTC is working properly. ● Check logic input functions 27 and 28.
e-31	EEPROM fault	● Data writing and read errors occur. ● The inverter has power failure during parameter reset.	● Power on the inverter to eliminate the fault. If the fault can not be eliminated, contact Qirod or its distributor for maintenance or repair of the inverter.
e-32	Control board fault	● Control board cannot work	● Connect manufacturer to maintain
e-33	Communication fault	● Network communication error.	● Check network control devices and cables. ● Check the setting of communication overtime parameter F803.

			● Check remote keyboard panel cable.
e-34	Current sensor fault	● The current sensor is in abnormal status.	● Replace the inverter.
e-35	Network fault	● Network error	● Check network control devices and cables.
e-36	Inverter type error	● Inverter hardware fault	● F 120=7 ● If error is still, connect manufacturer to maintain
e-38	AI1 signal Loss	● AI1 analog signal level is lower than the level set by the parameter F422.	● Check signal on AI1 to eliminate the cause of signal loss. ● Confirm whether F422 is correctly set.
e-39	Inverter inside communication error	● communication error between keyboard and control board CPU	● Connect manufacturer to maintain
e-41	Input phase failure	● The input side of the main circuit is phase failure. ● The inside component of the inverter is in abnormal state.	● Determine the cause of input phase failure and correct it. ● Set F405 = 0.
e-42	Output phase failure	● The output side of the main circuit is phase failure.	● Determine the cause of input phase failure (such as poor connection, open circuit of output or open circuit of motor winding) and correct it. ● Set F406 = 0.
e-43	Emergency stop fault	● Use the keyboard panel to perform stop operation when the motor works under remote mode.	● Perform fault reset.
e-45	Torque boost is too large	● Setting of torque boost parameter F203 is too high. ● Motor impedance is too low.	● Repeat self-tuning of the inverter and downward tune parameter F203.
e-46	Self-setting error	● Confirm whether motor	● Correctly set motor rated parameters.

		rated parameter settings are correct. ● The motor capacity is far smaller than that of the inverter. ● Cable of the motor is too thin. ● Motor is still in rotation when the self-setting starts.	● Use inverter with larger capacity. ● Apply thicker cable of the motor. ● Confirm the motor has stopped before the self-setting begins.

6.2. Description of alarm and indication code

Table 6.2 Alarm display and measures

Code	Description	Cause	Measures
a-00	Fault reset is acceptable.	Under fault code display state, press STOP key and a-00 is displayed.	Press the STOP key again and the fault is eliminated.
a-01	Undervoltage indication	Insufficient input voltage	Check the 3-phase input power supply. If the power supply is normal, the inverter has to be repaired.
0.0 (flash)	“Running ready” is invalid	Under remote control mode the corresponding terminal to the logic input function 1 is not closed.	Configure one logic input function as 1, and close this terminal.
a-05	Abnormal setting of frequency point	Frequency points at point 1 and point 2 are set too closely.	Do not set F325 and F327 too closely. Do not set F329 and F331 too closely.
a-06	Free stop action during transient power failure.	f501 is set to 2 and transient power failure occurs.	Input running signal to the inverter again or reset the inverter.
a-07	In DC braking	DC braking function is activated.	If the code disappears in several seconds, the inverter comes back to normal.
a-08	In running retrial	The inverter is in the process of restart. Forward/reverse speed tracking and restart function	The alarm code is momentarily displayed then disappears, and the inverter restarts.

		(STR function) is activated.	
a-10	In low speed sleep	See parameter F501.	Disabled This function or raise the frequency instrution to F006+F906.
a-11	Key fault on the keyboad	Certain key on the keyboard panel is continously pressed more than 20 s or the panel is damaged.	If all keys are released but the alarm does not disappear, the inverter has to be repaired.
a-12	In the process of parameter initialization	See parameter F120.	If the alarm code is momentarily displayed and then disappears, the inverter comes back to normal.
a-13	Loss of analog signal	Analog input terminal detection level is lower than the setting level of F422.	Check analog input terminal
e1	Exceeding displayed digit number by 1 digit	Displayed digit number exceeds 4 digits.	Try to reduce the setpoint of F422.
eun1	In the process of self-setting	Inverter is performing self-setting.	If the alarm code is momentarily displayed and then disappears, the inverter comes back to normal.

Table 6.3 Display of early warning code

Code	Type	Description
---c	Overcurrent early warning	Inverter is in current amplitude limiting state. See parameters F107 and F111.
--u-	Overvoltage early warning	Inverter approaches overvoltage fault. See parameters F415 and F416.
-i--	Overload early warning	This code is displayed when the motor or inverter overload counter exceeds 50%.
h---	Overheat early warning	Inverter approaches overheat fault.

Note: Early warning types can occur simultaneously. E.g, when overheat early warning and overcurrent early warning happen in the same time, the corresponding code is h--c.

6.3. Restart of the inverter after fault occurs

After failure occurs in the inverter, it can be restarted only when the cause of the failure has been eliminated. Please follow the undermentioned operations to realize fault reset of the inverter.

1 When the command source of the inverter is keyboard panel (under local control mode, or under remote mode and F002 = 1), press STOP key on the keyboard panel after the fault is eliminated. The keyboard will display a-00. Press the STOP key again, and the inverter realizes fault reset. At this moment it is allowable toto re-supply power to the motor.

2 When the inverter is under remote control mode and F002 = 0, set the input function configuration of any logic input terminal to 10. Then the inverter can use this terminal to perform fault reset.

3 When the inverter is under remote control mode and F002 = 2, fault reset is realized through remote communication devices. See *Appendix A: Serial communication*.

4 Switch off the inverter and power it on again.

Note: When the fault is motor or frequency overload (e-21 or e-22), inverter reset function can not be performed if computed cooling time is not up. The computed cooling time is specified as: e-21, 30 seconds after the fault occurs; e-22, 120 seconds after the the fault occurs.

APPENDIX A: SERIAL COMMUNICATION

Serial communication is the information exchange channel of the inverter with upper computer. Through serial communication, users can use personal computer or industrial control equipment (such as PLC etc) as host to set inverter (slave)'s running frequency or command, modify or read data, read working state and fault information etc and realize remote or centralized control of the inverter.

QD200 series inverters adopt RS-485 bus and Modbus protocol for serial communication.

A1. RS-485 bus

The hardware circuit of serial communication for QD200 series frequency inverter follows RS-485 standard and a RJ45 interface is provided. Here RS-485 two-wire wiring method is adopted. The array sequence of the corresponding pins of RJ45 interface is shown as below:

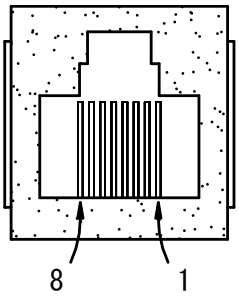


Figure A.1 RJ45 front view

Table A.1 Pin output signal allocation

Pin	Signal description
1	Reserved
2	Common port (signal ground & power ground)
3	Reserved
4	A (RS-485)
5	B (RS-485)
6	Reserved
7	+24 V
8	Common port (signal ground & power ground)

RS-485 two-wire wiring method is half-duplex serial communicaition. At the same moment the host and slave can not simultaneously transmit or receive data. Only one transmits data and another receives them.

RS-485 two-wire wiring method supports bus-type topological structure. At most 32 nodes can be connected to the same bus. Normally master-slave communication method is adopted in the RS-485 communication network, namely, one master commands as many as 31 slaves.

Under the circumstance of multi-computer communication or long-distance communication, it is suggested to connect the signal ground of the master station with the common port of the inverter to raise the ant-inteference ability of communicaiton.

A2. Modbus protocol

Modbus is a master-slave communication protocol. The master governs the whole communication process. Only when the master sends command to the slave, the slave executes the actions or/and send feedback information to the master. Otherwise the slave performs no operation and the slave can not communicate with each other directly.

There are two kinds of dialogs between the master and slaves:

(1) Point-to-point: Master sends command individually to a certain slave which executes action or/and sends feedback information.

When the master command is correct, the slave executes corresponding actions and transmits feedback of result information to the master.

When the master command is false, the slave transmits feedback of error information to the master but executes no actions.

(2) Broadcast mode: The master sends command to all slaves which execute action but send no feedback informatioin.

Modbus protocol has two kinds of transmission patterns: Modbus RTU and Modbus ASCII. VSC series frequency inverter supports Modbus RTU.

A2.1 Description of Modbus-RTU message format

When the Modbus-RTU mode is used for communication, the communication information (message) is represented directly with hexadecimal code (1-9, A-F). Two hexadecimal codes form one byte. The message format is shown as below:

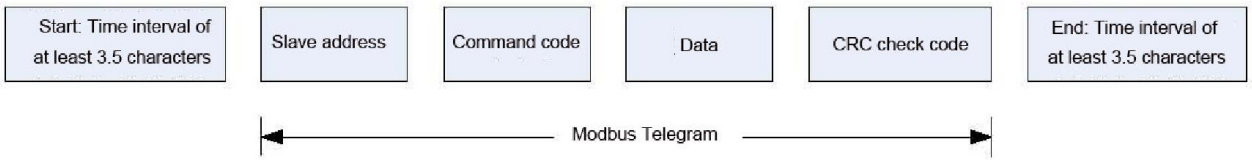


Figure A.2 Modbus Message Format

As shown in Figure A.2, during the communicaiton process, the master and slave determine the start and end of Modbus message according to time interval of at least 3.5 characters. The message includes the complete data information to be transmitted: in the sequence of slave address, command code, data and CRC code. Its length varies with the change of the command code.

The message of Modbus-RTU is classified into three types and two formats:

1) Request (Interrogation) message: Command request message transmitted by master to slave;

2) Normal response message: The slave's feedback message when the master's command is correct.

3) Error response messsage: The slave's feedback message when the master's command is false / invalid.

1) and 2) have the same format, while 3) adopts other format.

1. Format of request message and normal response message

Table A.2 Format of request message and normal response message

Number	Name	Function
1	Slave address	● Configured from 0 to 247 ● All slaves execute command but provide no feedback information; If slave address is set to 1~247, the dialog is point-to-point mode. All address-matching slaves execute command and provide feedback information. ● Under the point-to-point mode, when the matching slave responses, it sends back the slave address of itself.
2	Command code	● QD200 series frequency inverter supports part of command codes of Modbus protocol. ● All slaves execute command code and the matching slave responses code include: (1) 03H:Read one word (2 bytes) (2) 06H:Write one word (2 bytes) ● During error response, the feedback command code of the slave = the request command code of the master + 80H.
3	Data	● This part is the main content of communication and the core of data exchange. Its content and length vary with the variation of the command codes. See the following concrete decriptions of every command code.
4	CRC code	● Cyclical redundancy check (CRC) code is used for error detection of received data done by the receiving equipment and for judging whether the received data are correct. Please refer to "A2.3 Cyclical redundancy check (CRC)" for generation of CRC code. Note: CRC code first sends low bytes then high bytes. Except this, all messages of Modbus-RTU adopt the transmission sequence of "high bytes first - then low bytes".

A2.2 Detailed message description of different commands

A2.2.1 Read one word (2 bytes) —— command code 03H

1. Master request message

Table A.3 Format of master request message

Slave address	Command code	Communication address		Read word number		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		High byte	Low byte	High byte	Low byte	High byte	Low byte
	03H			00H	01H		

1) Slave address and CRC code: See *"Table A.2"*.

2) Command code: 03H. Request to read 1 word (2 bytes) of the slave.

3) Communication address: The address of read data. This is not the real physical address for data storage, but a number corresponding to the data. Every control, state or monitoring parameter of QD200 series frequency inverter corresponds to a communication address. See *"A2.5 Communication parameter"*.

4) Read word number: The length of the read data with the word (2 bytes) as the count unit. When current request asks for reading one word, it is set to 0001H.

2. Message of slave normal response

Table A.4 Slave normal response message

Slave address	Command code	Communication address	Read word number		CRC code	
1 byte	1 byte	2 bytes	2 bytes		2 bytes	
			High byte	Low byte	Low byte	High byte
	03H	02H				

1) Slave address and CRC code: See "A2.2".

2) Command code: 03H. The same as the master request command code.

3) Read word number: The length of the read data with byte as the count unit. When current master requests to read one word, set read byte number transmitted from the slave to 02H.

Note: The count unit of the length of the read data is different from that of request message.

4) Read data: Data corresponding to the communication address in the request message.

Note: Read data firstly sends high byte then low byte in an opposite direcition to CRC code.

3. Slave error response message

Table A.5 Slave error response message of Command code 03H

Slave address	Command code	Error code	CRC code	
1 byte	1 byte	1 byte	2 bytes	
			Low byte	High byte
	83H			

1) Slave address and CRC code: See *"A2.2"*.

2) Command code: 83H. It is = 03H + 80H.

3) Error code. For detail see "A2.4 Error code".

4) Example: Read upper limit frequency.

Master request message: 01 03 00 08 00 01 05 C8

Normal response message: 01 03 02 13 88 B5 12 (Suppose that current upper limit frequency is 50 Hz)

Error response message: 01 83 03 01 31 (Suppose that read word number is altered from 0001 to 0002)

A2.2.2 Write one word (2 bytes) — Command code 06H

1. Master request message

Table A.6 Format of master request message

Slave address	Command code	Communication address		Write data		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		High byte	Low byte	High byte	Low byte	Low byte	High byte
	06H						

1) Slave address and CRC code: See *"Table A.2"*.

2) Command code: 06H. Request to write 1 word (2 bytes) of the slave.

3) Communication address: The address of read data. This is not the real physical address for data storage, but a number corresponding to the data. Every control, state or monitoring parameter of QD200 series frequency inverter corresponds to a communication address. See *"A2.5 Communication parameter"*.

4) Write data: Request data written by the slave.

2. Slave normal response message

Table A.7 Slave normal response message

Slave address	Command code	Communication address		Write data		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		High byte	Low byte	High byte	Low byte	Low byte	High byte
	06H						

Slave's normal response message is the same as the master's request message.

3. Slave error response message

Table A.8 Format of slave error response message

Slave address	Command code	Error code	CRC code	
1 byte	1 byte	1 byte	2 bytes	
			Low byte	High byte
	86H			

1) Slave address and CRC code: See *"Table A2.2"*.

2) Command code: 86H. It is = 06H + 80H.

3) Error code. For detail see *"A2.4 Error code"*.

4. Example: To write upper limit frequency

Master request message: 01 06 00 08 13 24 05 23 (Suppose that the set upper limit frequency is 49 Hz)

Normal response message: 01 06 00 08 13 24 05 23

Error response message: 01 86 04 43 A3 (Suppose current writing operation can not be performed)

A2.3 Cyclic redundancy check (CRC)

Modbus-RTU's communication message uses cyclic redundancy check (CRC) for transmission error check.

During each communication, the sender computes CRC code of transmitted data according to CRC rules, then sends the data by attaching the CRC code to them; After receiving the data, the receiver re-computes the CRC code according to the same rules. The computed content does not include the received CRC code. The reciever compares the re-calculated CRC code with the received code. If they are not the same, the transmitted data are determined to be false.

QD200 series frequency inverter adopts CRC16 rule for message check of serial communication. Every CRC code consists of 2 bytes, including 16-bit binary value. The calculation is as follows:

1) Initialize CRC register (16 bit) to 0xFFFF;

2) Perform XOR to the first byte (slave address) and the low 8 bits of the register, and then put the computed result back to CRC register;

3) Make a right shift by 1 bit to the content of CRC register and fill in the highest bit with 0;

4) Check the shift-out bit after right shift;

- If the shift-out bit is 0, repeat 3), namely, make another right shift;
- If the shift-out bit is 1, make XOR to CRC register and 0xA001, and put the computed result back to the CRC register;

5) Repeat steps 3) and 4) until 8 right shifts are made. Implement the same procedure to all the 8-bit data;

Repeat steps 2) ~ 5) to implement the processing of the next byte in the message;

7) After all the bytes in the message are computed according to the above procedures, the content in the CRC register is the CRC code.

After the CRC code is acquired through the above-mentioned method, attach it to the transmitted data and send them. It is necessary to exchange the high and low bytes of the CRC code, namely, to send the low byte firstly and then the high byte.

There are two methods to compute CRC code with software: table look-up and on-line computation. Computation speed of the table look-up is fast but its table data occupy considerable space; On-line computation method requires no table data. It saves space but needs much time. Suitable computation method is selected according to concrete circumstance during application.

A2.4 Error code

When the slave is not able to implement master's request, the slave gives feedback of corresponding error code to indicate cause of the current error. Refer to the following table for the concrete meaning of error code.

Table A.9 Description of error code

Error code	Description
01	Command code error
	● Command code other than 03H and 06H is set in the request message
02	Communication address error
	● Visited communication address does not exist. ● The register corresponding to the communication address does not permit performance of the action demanded by the currrent command code.
03	Data setting error
	● Written data exceeds the allowable range of the register. ● Improper setting of certain parameter in the request message.
04	Unable to continue implementing the master's request.
	● Error occurs during the process of writing data. ● Currently the register corresponding to the communication address does not permit performance of the action demanded by the command code.

A2.5 Communication parameter

1. Control parameter

Control parameters are edited through serial communication in order to realize inverter's function setting, running frequency setting, start/stop control and logic/analog output setting.

1) Basic parameters

Basic parameters consist of 10 groups: f0 – f9. They are used to control the function setting of the inverter. Their detailed description, communication addresses and value ranges are shown in *"5. Detailed description of parameters"*.

Note: The communication address of the basic parameter corresponds to its display code. However, it is required to change F at the highest bit to 0;

Example: The display code of parameter "Running command selection" is f001, so the corresponding communication address is 0001;

Another example: The display code of parameter "Default keyboard panel display value" is f702, so the corresponding communication address is 0702.

2) Communication control word (Communication address: fa05)

Table A.10 Detailed description of communication control word

Bit	Description of function	0	1	Default value
0	JOG	NO-JOG	Jog frequency	0
1	Forward/reverse rotation	Forward rotation	Reverse rotation	0
2	Running/stop	Stop	Running	0
3	Free stop	No action	Free stop	0
4	Emergency stop	No action	Emergency stop	0
5	Fault reset	No action	Reset	0
6	Given frequency by communication	Disable	Enable	0
7	Given code by communication	Disable	Enable	0
8	Multi-speed 1	OFF	ON	0
9	Multi-speed 2	OFF	ON	0
10	Multi-speed 3	OFF	ON	0
11	Multi-speed 4	OFF	ON	0
12	Motor parameter switch	1nd Motor Parameter	2nd Motor Parameter	0
13	PID control Disabling	Enabling PID control	Disabling PID control	0
14	Acceleration/ deceleration curve switch	Acceleration/ deceleration curve 1	Acceleration/ deceleration curve 2	0
15	DC braking	No DC braking	DC braking start	0

3) Communication running frequency setting (Communicaiton address: fa08)

Table A.11 Communication running frequency setting

Bit	Description of function	Default
0-15	Running frequency data of communication setting. Hexadecimal setting: 50Hz→(50Hz)x100 = 5000→1388Hz It is if setting: 50Hz, write 1388H in the FA08 address	0.0

4) Communication analog output setting (Communicaiton address: fa16)

Table A.12 Communication analog output setting

Bit	Description of function	Lower limit	Upper limit	Default
0-15	Analog output data of communicatioin setting (in correspondence with analog output function 10)	0 （0000H）	1023 （03FFH）	0

2. Monitoring parameter

Read monitoring parameter through serial communication in order to view the running state of the inverter. The following table provides part of monitoring parameters. See *“5.11 Monitoring function parameter group”* for other parts.

Table A.13 Communication running frequency setting

No.	Communication address	Description of function	Unit	Note
1	fd06	Real-time running state	-	See table A.17 for details
2	fd05	Real-time running frequency	0.01 Hz	
3	fe10	Actual output frequency	0.01 Hz	
4	fe50	DC bus input voltage	0.01 %	
5	fe51	Output voltage	0.01 %	
6	fe49	Output current	0.01 %	
7	fe12	Output torque	0.01 %	
8	fe21	Output power	0.01 kW	
9	fe45	Motor speed (estimated)	1 rpm	
10	fe03	Logic input	-	See A.18 for details
11	fe04	Logic output	-	See A.19 for details
12	fe22	Logic input AI1 (10-bit accuracy)	-	Range (0-1023)
13	fe23	Logic input AI2 (10-bit accuracy)	-	Range (0-1023)
14	fc59	Fault monitoring	-	See A.20 for details

Table A.14 Real-time running state monitoring

Communication address	Description of function		
FD03	Real-time running state monitoring		
Bit	Description	0	1
0	Reserved	-	-
1	Fault	No fault	Tripping
2-8	Reserved	-	-
9	Forward/reverse rotation	Forward rotation	Reverse rotation
10	Running/stop	Stop	Running
11-15	Reserved	-	-

Table A.15 Logic input state monitoring

Communication address	Description of function		
FE11	Logic input state monitoring		
Bit	Description	0	1
0	Terminal L1	OFF	ON
1	Terminal L2	OFF	ON
2	Terminal L3	OFF	ON
3	Terminal L4	OFF	ON

4	Terminal L5	OFF	ON
5	Terminal L6	OFF	ON
6	Terminal L7 or As AI1 during logic input	OFF	ON
7	Terminal L8 or As AI1 during logic input	OFF	ON
8-15	Reserved	-	-

Table A.16 Logic Output state monitoring

Communication address	Description of function		
FE11	Logic output state monitoring		
Bit	Description	0	1
0	Terminal LO-CLO	OFF	ON
1	Relay T2	OFF	ON
2	Relay T1	OFF	ON
3-15	Reserve	-	-

Table A.17 Fault monitoring

Communication address	Description of function	
FC39	Fault monitoring	
Value	Corresponding fault	Panel display
0000H	No fault	nerr
0001H	Acceleration overcurrent	e-01
0002H	Deceleration overcurrent	e-01
0003H	Constant speed overcurrent	e-01
0008H	Input phase failure	e-41
0009H	Output phase failure	e-42
000AH	Acceleration overvoltage	e-11
000BH	Deceleration overvoltage	e-11
000CH	Constant speed overvoltage	e-11
000DH	Inverter overload	e-21
000EH	Motor overload	e-22
0010H	Overheat tripping	e-24
0011H	Emergency tripping	e-43
0012H	EEPROM error 1 (write error)	e-31
0013H	EEPROM error 2 (Read error)	e-31
0014H	EEPROM error 3 (Internal error)	e-31
0018H	External communication error	e-33
001AH	Current detection fault	e-34
001EH	Undervoltage	e-12

APPENDIX B: CONCISE PARAMETER LIST

[-f0-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f000	Operation frequency of keypad	f009~f008	0.0	○	
f001	V/F control mode selection	0: V/F constant 1：Variable torque 2：Sensor-less vector control 3：Energy saving	0	●	
f002	Command mode selection 1	0：Terminal board 1：Keypad 2：Serial communication	1	●	
f003	Frequency setting mode selection 1	0：Built-in potention meter 1：AI1 input 2：AI2 input 3：Keypad 4：Serial communication 5：UP/DOWN setting 6：AI1+AI2 7：PID setting of keypad	3	●	
f004	Command mode selection 2	0：Terminal board 1：Keypad 2：Serial communication	0	○	
f005	Frequency setting mode selection 2	0：Built-in potention meter 1：AI1 input 2：AI2 input 3：Keypad 4：Serial communication 5：UP/DOWN setting 6：AI1+AI2	2	○	

		7：PID setting of keypad			
f006	Frequency priority selection	0: f003 switchable to f005 1：f003	0	○	
f007	Maximum frequency	30.0~400.0 Hz	50.0	●	
f008	Upper limit frequency	0.5 Hz ~f007	50.0	○	
f009	Lower limit frequency	0.0 Hz ~f008	0.0	○	
f010	Acceleration time 1	0.0~3200 s	varies by model	○	
f011	Deceleration time 1	0.0~3200 s	varies by model	○	
f012	PWM carrier frequency	1.5k~12.0 kHz	varies by model	○	
f013	Carrier frequency control mode selection	0：not reduced automatically 1：reduced automatically	1	●	
f014	Random PWM mode	0: Disable. 1: Enable.	0	○	
f015	Automatic acceleration/deceleration	0: Disabled (manual). 1: Automatic (at acceleration & deceleration) 2: Automatic (only at acceleration)	0	●	
f016	Factory reserved	-	-		
f017	Parameter setting mVSCo function	0: Disabled 1：2-wire control 2：3-wire control 3：External input UP/DOWN setting	0	●	
f018	Factory reserved	-	-		
f020	Factory reserved	-	-		

[-f1-]

NO.	Parameter Name	Setting Range	default	WRT	User setting
f100	Auto-tuning	0: Auto-tuning disabled 1: Application of individual settings of f203 2: Auto-tuning enabled	0	●	
f101	Base frequency 1	25.0~400.0 Hz	50.0	●	
f102	Base frequency voltage1	50~660 V	varies by model	●	
f103	Motor rated current	0.1~200.0 A	varies by model	●	
f104	Motor rated speed	100~15000 rpm	varies by	●	

			model		
f105	Motor no-load current	10.0~100.0%	varies by model	●	
f106	Motor electronic thermal protection level 1	varies by model	varies by model	○	
f107	stall prevention level 1	varies by model	varies by model	●	
f108	Base frequency 2	25.0~400.0 Hz	50.0	●	
f109	Base frequency voltage 2	50~660V	varies by model	●	
f110	Motor electronic-thermal protection level 2	varies by model	varies by model	○	
f111	Stall prevention level 2	varies by model	varies by model	○	
f112	factory reserved	-			
f113	factory reserved	-			
f114	factory reserved	-			
f115	factory reserved	-			
f120	Default setting	0: - 1: Standard default setting (Initialization) 2: Save user-defined parameters 3: Call user-defined parameters 4: Trip record clear 5: Cumulative operation time clear 6: Cumulative fan operation time record clear 7: Initialization of type information 8: P-type rating. 9: G-type rating.	0	●	

[-f2-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f201	Supply voltage correction	0: Supply voltage uncorrected, output voltage limited. 1: Supply voltage corrected, output voltage limited. 2: Supply voltage uncorrected, output voltage unlimited. 3: Supply voltage corrected, output voltage	3	●	

		unlimited.			
f202	Voltage boost 1	0.0~30.0%	varies by model	○	
f203	Torque boost	0.0~30.0%	varies by model	○	
f204	Slip frequency gain	0~150%	50	○	
f205	Exciting current coefficient	100~130	100	●	
f206	Voltage boost 2	0~30%	varies by model	○	
f207	Speed control response coefficient	1~150	40	●	
f208	Speed control stability coefficient	1~100	20	●	
f209	Stall prevention control coefficient 1	10~250	100	●	
f210	Stall prevention control coefficient 2	50~150	100	●	
f211	Maximam voltage adjustment coefficient	90~120%	104	●	
f212	Waveform switching adjustment coefficient	0.1~14kHz	14.0	●	
f213	factory reserved				
f214	factory reserved				
f215	factory reserved				
f216	factory reserved				
f217	multipoint profile V/F patter	0: factory reserved. 1: factory reserved. 2: Enable multipoint profile V/F patter.	0	●	
f218	point 1 output frequency (f1)	0~f220	10.0	●	
f219	point 1 output frequency voltage (V1)	0~100%	20.0	●	
f220	point 2 output frequency (f2)	f218~f220	20.0	●	
f221	point 2 output frequency voltage (V2)	0~100%	40.0	●	
f222	point 3 output frequency (f3)	f220~f101	30.0	●	
f223	point 3 output frequency voltage (V3)	0~100%	60.0	●	

[-f3-]					
NO.	Parameter Name	Setting Range	default	WRT	User

					setting
f300	AI1 terminal function selection	0: AI1 - analog input 1: AI1 - contact input (Sink mode) 2: AI1 - contact input (Source mode)	0	●	
f301	Input terminal function for LI1	0: No function is assigned 1: Standby terminal 2: Forward run command 3: Reverse run command 4: Jog run mode 5: Acceleration/deceleration 2 pattern selection 6: Preset-speed command 1 7: Preset-speed command 2 8: Preset-speed command 3 9: Preset-speed command 4 10: Reset command 11: Trip stop command from external input device 13: DC braking command 14: PID control disabling 15: Permission of parameter editing 16: Combination of standby and reset commands 17: Frequency source switching to AI1 18: Combination of forward run and jog run 19: Combination of reverse run and jog run 20: Frequency setting source switching 21: No.2 Switching of V/F setting	2	●	
f302	Input terminal function for LI2		3	●	
f303	Input terminal function for LI3		0	●	
f304	Input terminal function for LI4		10	●	
f304	Input terminal function for LI4	22: No.2 motor switching 23: Frequency UP signal input from external contacts 24: Frequency DOWN signal input from external contacts 25: Frequency UP/DOWN cancellation signal input from external contacts 26: inversion of trip stop command from external device 27: Thermal trip stop signal input from external device 28: inversion of thermal trip stop	10	●	

		signal input from external device 29: Forced switching from remote to local control 30: Operation holding (stop of 3-wire operation) 31: Forced switching of command mode and terminal board command 32: Display cancellation of the cumulative power amount (kWh) 33: Fire-speed control 34: Coast stop (gate off) 35: Inversion of Reset 36: Forced switching of stall prevention level 2 37: PID control integral value clear PID control integral value clear 38: inversion of PID error signal 39~69: Not used			
f305	AI1 voltage-current input selection	0:0 ~ 5V voltage signal input. 1:0 ~ 10V voltage signal input. 2: 0-20mA(4-20mA) current signal input.	0	●	
f306	sink/soruce mode selection	0: Source (Positive) logic terminal mode. 1: Sink (Negative) logic terminal mode	1	●	
f307	AO voltage-current output selection	0: Current signal output. 1: Voltage signal output.	1	●	
f308	Input terminal function of AI1	f301~f304	0	●	
f309	Always-active terminal selection 1	f301~f304	1	●	
f310	Always-active terminal selection 2	f301~f304	0	●	
f311	Output terminal function A of LO-CLO	f315	4	●	
f312	Output terminal function B of LO-CLO	f315	255	●	
f313	AI2 terminal function selection	0: AI2 - analog input 1: AI2 - contact input (Sink) 2: AI2 - contact input (Source)	0	●	
f314	Input terminal function of AI2	f301~f304	0	●	
f315	Output terminal function	0: Frequency lower limit	40	●	

	A of T1 (T1A-T1B-T1C)	2: Frequency upper limit 4: Low speed 6: ACC/DEC complete 8: Speed reach (F338) 10: Speed reach2 (F338) 12: FB(AI1) equal frequency command 14: FB(AI2) equal frequency command 16: AI1 reach F340 18: AI1 reach F342 20: AI2 is final selected FC 22: Inverter run 24: echo back signal (ready without ST/RUN command) 26: Forward 、 reverse runing 28: ON=Local /OFF=Remote 30: Fault latch (Off at rtry) 32: Over torque:latch at fault 34: Under current :latch at fault 36: Heavy fault 38: Light fault 40: Fault latch (With on rtry) 42: All of are alarm			
f315	Output terminal function A of T1 (T1A-T1B-T1C)	44: Over load1or 2 pre alarm 46: PBr OH pre alarm 48: OT pre alarm 50: alarm of cumulative time 52: alarm of life time 54: Alarm of PTC thermistor 56: status of MOFF signal 58: status of brake. 60~253：Not used 254：Always OFF 255：Always ON	40	●	
f316	Output terminal logic selection of LO-CLO	0：And logic 1：Or logic	0	●	
f317	LO-CLO output delay	0.0~60.0 s	0.0	○	
f318	T1 output delay	0.0~60.0 s	0.0	○	
f319	External contact input - UP response time	0.0~10. 0 s	0.1	○	

f320	External contact input - UP frequency steps	0.0 Hz ~f007	0.1	○	
f321	External contact input - DOWN response time	0.0~10.0 s	0.1	○	
f322	External contact input - DOWN frequency steps	0.0 Hz ~f007	0.1	○	
f323	Initial up/down frequency	0.0 Hz ~f007	0.0	○	
f324	Change of the initial up/down frequency	0：disabled 1：enabled	1	○	
f325	AI1 input point 1 setting	0~100%	0	○	
f326	AI1 input point 1 frequency	0.0~400.0 Hz	0.0	○	
f327	AI1 input point 2 setting	0~100%	100	○	
f328	AI1 input point 2 frequency	0.0~400.0 Hz	50.0	○	
f329	AI2 input point 1 setting	0~100%	0	○	
f330	AI2 input point 1 frequency	0.0~400.0 Hz	0.0	○	
f331	AI2 input point 2 setting	0~100%	100	○	
f332	AI2 input point 2 frequency	0.0~400.0 Hz	50.0	○	
f333	AI1 input bias	0~255	varies by model	○	
f334	AI1 input gain	0~255	varies by model	○	
f335	AI2 input bias	0~255	varies by model	○	
f336	AI2 input gain	0~255	varies by model	○	
f337	Low-speed signal output frequency	0.0 Hz ~f007	0.0	○	
f338	Speed reach detection output frequency	0.0 Hz ~f007	0.0	○	
f339	Speed reach detection band	0.0 Hz ~f007	2.5	○	
f340	AI1 input reach detection level	0~100%	0	○	
f341	AI1 input reach detection band	0~20%	3	○	
f342	AI2 input reach detection level	0~100%	0	○	
f343	AI2 input reach detection band	0~20%	3	○	
f344	Frequency command agreement detection	0.0 Hz ~f007	2.5	○	

	range				
f345	Logic output/pulse train output selection (LO-CLO)	0: Logic output 1: Pulse train output	0	●	
f346	Pulse train output function selection (LO - CLO)	0: Output frequency 1: Output current 2: Set frequency (Before PID) 3: Frequency setting value (After PID) 4: DC voltage 5: Output voltage command value 6: Input power 7: Output power 8: AI1 Input value 9: AI2 Input value 10: Torque 11: Torque current 12: Motor cumulative load factor 13: Inverter cumulative load factor 14: PBR (braking reactor) cumulative load factor	0	○	
f347	Maximum numbers of pulse train	500~1600	800	○	
f348	AO1 selection	0: Output frequency 1: Output current 2: Set frequency (betore PID) 3: Frequency setting value (after PID) 4: DC voltage 5: Output voltage command value 6: Input power 7: Output power 8: AI1 input 9: AI2 input 10: Torque 11: Torque current 12: Motor cumulative load factor 13: Inverter cumulative load factor 14: brake resistor cumulative load factor 15: Serial communication data 16: For adjustments (f349 set value is displayed.)	0	○	

f349	AO gain adjustment	0~1280	varies by model	○	
f350	Inclination characteristic of analog output	0：Negative 1：Positive	1	○	
f351	Bias of analog output	0~100%	0	○	
f352	output frequency when AO = 0V	0 Hz ~f007	0.0	○	
f353	output frequency when AO = 10V	0 Hz ~f007	0.0	○	
f354	AO1 bias	0~255	128	○	
f355	Input terminal function for LI5	f301~f304（15kW and above）	0	●	
f356	Input terminal function for LI6	f301~f304（15kW and above）	0	●	
f357	Input terminal function for LI7	f301~f304（15kW and above）	0	●	
f358	Input terminal function for LI8	f301~f304（15kW and above）	0	●	
f359	Output terminal function A of T2	f315（15kW and above）	0	●	
f360	Output terminal function B of T2	f315（15kW and above）	0	●	
f361	Output terminal logic selection of T2	0：And Logic（15kW and above） 1：Or Logic	0	●	
f362	T2 output delay	0~60.0s（15kW and above）	0.0	●	
f363	Input terminal active mode	0: Input terminal function active when input terminal is OFF. 1: Input terminal function inactive when input terminal is ON.			
f364	Input terminal filter time	0~200	0		
f365	Output terminal function B of T1	0~ 69	0		
f366	Output terminal logic selection of T1	0~1	0		
f367	Termianl run detection selection at power on	0：disable 1：enable	0		

[-f4-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f400	Retry selection	0: disabled 1~10 times.	0	●	

f401	Electronic-thermal protection characteristic selection	0：Trip enable，stall disable (standard motor) 1：Trip enable，stall enable (standard motor) 2：Trip disable，stall disable (standard motor) 3：Trip disable，stall enable (standard motor) 5：Trip enable，stall disable (forced cooling motor) 6：Trip enable，stall enable (forced cooling motor) 7：Trip disable，stall disable (forced cooling motor) 8：Trip disable，stall enable (forced cooling motor)	2	○	
f402	Motor 150%-overload time limit	10-2400 s	300	○	
f403	Emergency stop selection	0: Coast stop 1: Slowdown stop 2: Emergency DC braking	0	●	
f404	emergency braking time	0.0-20.0 s	1.0	○	
f405	Input phase failure detection	0: Disabled, No tripping. 1: Enabled	0	●	
f406	Output phase failure detection mode selection	0: Disabled 1: At start-up (Only one time after power is turned on) 2: At start-up (each time) 3: During operation 4: At start-up + during operation 5: Detection of cutoff on output side	0	●	
f407	Small current trip/alarm selection	0：Alarm 1：trip	0	○	
f408	Small current detection current	0~100%	0.00	○	
f409	Small current detection current hysteresis	1~20%	10	○	
f410	Small current detection time	0-255 s	0	○	

f411	Over-torque trip/alarm selection	0：Alarm 1：trip	0	○	
f412	Over-torque detection level	0~250%	130	○	
f413	Over-torque detection level hysteresis	0~100%	10	○	
f414	Over-torque detection time	0.0~10.0 s	0.5	○	
f415	Overvoltage limit operation	0: Enabled. speed. 1: Disabled 2: Enabled (Quick deceleration). 3: Enabled (Dynamic quick deceleration).	2	●	
f416	Overvoltage limit operation level	100-150%	130	●	
f417	Undervoltage trip/alarm selection	0: Alarm only (detection level below 60%) 1: Tripping (detection level below 60%). 2: Alarm only (detection level below 50%)	0	●	
f418	Instantaneous power failure coast stop selection	0: disabled 1: factory reserved 2: Coast stop.	0	●	
f419	Forced fire-speed control function	0: Disabled. 1: Enabled.	0	○	
f420	Detection of output short-circuit during start-up	0: Each time (standard pulse) 1: Only one time after power is turned on (standard pulse) 2: Each time (short-time pulse) 3: Only one time after power is turned on (short-time pulse)	0	●	
f421	Motor electric-thermal protection retention selection	0: disabled. 1: Enabled.	0	○	
f422	AI1 input loss	1~100%	0	○	
f423	Activation of the inverter during 4-20mA signal loss	0: No measures. 1: Coast stop. 2: switch to Fallback speed. 3: Speed maintaining. 4: Slowdown stop.	0	●	

f424	Fallback speed	0.0 Hz ~f007	0.0	○	
f425	PTC thermal selection	0: Disabled 1: Enabled (trip mode) 2: Enabled (alarm mode)	0	○	
f426	Resistor value for PTC detection	100-9999Ω	3000	○	
f428	Cumulative operation time alarm setting	0.0-999.9 h (0.1=10 小时)	610.0	○	
f429	Inverter trip retention selection	0：clearing 1：maintaining	0	○	

[-f5-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f500	Auto-restart control selection	0: Disabled 1: At auto-restart after momentary stop 2: When turning standby (input terminal function =1) on or off 3: At auto-restart or when turning standby (input terminal function =1) on or off 4: At start-up	0	●	
f501	auto-stop time limit for lower-limit frequency operation	0.0: disable 0.1-600.0 s	0.1	○	
f502	Bumpless operation selection	0: disabled. 1: enabled.	1	○	
f503	Starting frequency setting	0.5~10.0 Hz	0.5	○	
f504	Operation starting frequency	0.0 Hz ~f007	0.0	○	
f505	Operation starting frequency hysteresis	0.0 Hz ~f007	0.0	○	
f506	DC braking starting frequency	0.0 Hz ~f007	0.0	○	
f507	DC braking current	varies by model	varies by model	○	
f508	DC braking time	0.0~20.0 s	1.0	○	
f510	Acceleration/deceleration 1 pattern	0：Linear	0	○	

		1：S pattern 1 2：S pattern 2			
f511	Acceleration/deceleration 2 pattern	0：Linear 1：S pattern 1 2：S pattern 2	0	○	
f512	Acceleration/deceleration 3 pattern	0：Linear 1：S pattern 1 2：S pattern 2	0	○	
f513	Acceleration/deceleration 1 and 2 switching frequency	0.0 Hz ~f008	0.0	○	
f514	Acceleration/deceleration 2 and 3 switching frequency	0.0 Hz ~f008	0.0	○	
f515	Selecting an acceleration/deceleration pattern	1：Acc/Dec 1 2：Acc/Dec 2 3：Acc/Dec 3	1	○	
f516	S-pattern lower-limit adjustment amount	0~50%	10	○	
f517	S-pattern upper-limit adjustment amount	0~50%	10	○	
f518	Acceleration time 2	0.0~3200 s	20.0	○	
f519	Deceleration time 2	0.0~3200 s	20.0	○	
f520	Acceleration time 3	0.0~3200 s	20.0	○	
f521	Deceleration time 3	0.0~3200 s	20.0	○	
f522	Reverse-run prohibition	0: Forward/reverse run permitted. 1: Reverse run prohibited. 2: Forward run prohibited.	0	●	
f523	stop pattern	0: Panel slowdown stop. 1: Panel coast stop. 2: Terminal coast stop.	0	○	
f527	regenerative braking selection	0: Disabled 1: Enabled (with resistor overload protection) 2: Enabled (without resistor overload protection)	2		
f528	regenerative braking resistance	1.0~1000.0Ω	20.0	●	

f529	regenerative braking resistor capacity	0.01~30.0 kW	0.12	●	

[-f6-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f600	Prohibition of panel reset operation	0: Permitted 1: Prohibited	0	○	
f601	Switching between remote control and Local control	0：Local control mode 1：remote control mode	1	○	
f602	Prohibition of change of parameter setting	0: Permitted 1: Prohibited	0	○	
f603	Current/voltage display mode	0: % 1: A (ampere)/V (volt),	1	○	
f604	Frequency free unit magnification	0：unit is Hz 0.01-200.0：free unit	0.00	○	
f605	Factory reserved	-	0	●	
f606	Inclination characteristic of free unit display	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1	○	
f607	Bias of free unit display	0.00 Hz ~f007	0.00	○	
f608	Free step 1 (pressing a panel key once)	Disabled：0.00 Enabled：0.01 Hz~f007	0.00	○	
f609	Free step 2 (panel display)	0：disabled 1~255：enabled	0	○	
f610	Standard monitor display selection	0: Output frequency(Hz(free)) 1: Frequency command(Hz(free)) 2:Output current(%/A) 3:Inverter rated current (A) 4:Inverter load (%) 5:Output power (kW) 6: Stator frequency (Hz (free))	0	○	

		7:communication data display 8: Output speed 9: Communication counter 10: Normal communication counter			
f611	panel running order clear selection	0 : clear 1 : keep	1	○	
f612	Panel operation prohibition (F000)	0: Permitted 1: Prohibited	0	○	
f613	Prohibition of panel operation (RUN/STOP keys)	0: Permitted. 1: Prohibition.	0	○	
f614	Prohibition of panel emergency stop operation	0: Permitted. 1: Prohibition.	0	○	
f616	Integral output power retention selection	0: (clear) 1: (memory)	1	○	
f617	Integral output power display unit selection	0: 1kWh. 1: 10kWh. 2: 100kWh. 3: 1000kWh.	varies by model	○	
f618	Search and resetting of changed parameters selection	0：disable 1：enable	0	○	
f619	factory reserved				
f620	factory reserved				
f621	factory reserved				
f622	factory reserved				
f623	factory reserved				

[-f7-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f700	Panel JOG mode selection	0: disable JOG key. 1: enable JOG key.	0	○	
f701	jog run frequency	0.0~20.0 Hz	5.0	○	
f702	Jog stopping pattern	0: Slow down stop. 1: coast stop.	0	●	

		2: DC braking.			
f703	Jump frequency 1	0.0 Hz ~f007	0.0	○	
f704	Jumping width 1	0.0 ~30.0 Hz	0.0	○	
f705	Jump frequency 2	0.0 Hz ~f007	0.0	○	
f706	Jumping width 2	0.0~30.0 Hz	0.0	○	
f707	Jump frequency 3	0.0 Hz ~f007	0.0	○	
f708	Jumping width 3	0.0~30.0 Hz	0.0	○	
f709	Braking mode selection	0~3	0	●	
f710	Release frequency	f503~20.0Hz	3.0	○	
f711	Release time	0~25.0s	0.5	○	
f712	Creeping frequency	f503~20.0Hz	3.0	○	
f713	Creeping time	0~25.0s	1.0	○	
f714	Droop gain	0~100%	0	○	
f715	Droop insensitive torque band	0~100%	10	○	
f716	Preset-speed 1	f009~f008	3.0	○	
f717	Preset-speed 2	f009~f008	6.0	○	
f718	Preset-speed 3	f009~f008	9.0	○	
f719	Preset-speed 4	f009~f008	12.0	○	
f720	Preset-speed 5	f009~f008	15.0	○	
f721	Preset-speed 6	f009~f008	18.0	○	
f722	Preset-speed 7	f009~f008	21.0	○	
f723	Preset-speed 8	f009~f008	24.0	○	
f724	Preset-speed 9	f009~f008	27.0	○	
f725	Preset-speed 10	f009~f008	30.0	○	
f726	Preset-speed 11	f009~f008	33.0	○	
f727	Preset-speed 12	f009~f008	36.0	○	
f728	Preset-speed 13	f009~f008	39.0	○	
f729	Preset-speed 14	f009~f008	45.0	○	
f730	Preset-speed 15	f009~f008	50.0	○	
f731	factory reserved				
f732	factory reserved				
f733	factory reserved				
f734	factory reserved				
f735	factory reserved				
f736	factory reserved				
f737	factory reserved				
f738	factory reserved				

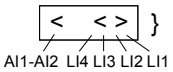
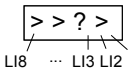
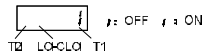
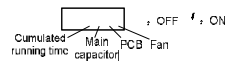
[-f8-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f800	Modbus baud rate	0：9600 bps 1：19200 bps 2：4800 bps 3：2400 bps 4：1200 bps	1	○	
f801	Modbus parity	0: NONE 1: EVEN 2: ODD	1	○	
f802	Modbus address	0-247	1	○	
f803	Modbus timeout	0: timeout check disabled. 1-100s	0	○	
f804	Modbus transger waiting time	0~2.00 s	0.00	○	
f805	Modbus behaviour on communication fault	0: Inverter stop, communication command, frequency mode open(by F002, F003) 1: None (continued operation) 2: Deceleration stop 3: Coast stop 4: Communication error (e-33 trip) or Network error (e-35 trip)	4	○	
f806	Number of motor poles for communication	1~8	2	○	
f821	factory reserved				
f822	factory reserved				
f823	factory reserved				
f824	factory reserved				
f825	factory reserved				
f826	factory reserved				
f827	factory reserved				
f828	factory reserved				
f829	factory reserved				
f830	PID setting of keypad	0~100%	0.0	○	

[-f9-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
f900	PID control	0: Disabled, 1: Enabled (Feedback: AI1) 2: Enabled (Feedback: AI2)	0	○	
f901	Proportional gain	0.01~100.0	varies by model	○	
f902	Integral gain	0.01~100.0	varies by model	○	
f903	Differential gain	0.00~2.55	0.00	○	
f904	PID control waiting time	0~2400 s	0	○	
f905	PID regulator diviation input signal negation	0：disable 1：enable	0	○	
f906	Sleep mode awakening hysteresis bandwidth	0.0 Hz ~f007	0.2	○	
f907	Sleeping mode awakening threshold based on PI deviation	0.0 Hz ~f007	0.0	○	
f908	Sleeping mode awakening threshold based on PI feedback	0.0 Hz ~f007	0.0	○	
f909	sleeping mode action	0: Motor slowdown to a stop. 1: Motor keep running at lower limit frequency.	0	●	
f910	wake up delay	0~600.0s	0.0	●	
f911	Auto wake up level	0~100.0%	0.0	○	
f912	Auto sleep level	Auto sleep level	0~100%	0.0	
f913	Upper limit of PID setting	0~100%	100		
f914	Lower limit of PID setting	0~100%	0		
f915	auto-stop time limit for lower-limit frequency operation	0~600.0	0.1		
f916	PID setting of keypad	0~100%			

Note 1：in the volume of “WRT”，“○”：means writable at stop or running status.；“●”：means unwritable at stop or running status；

Note 2：we can obtained modbus parameter address by replacing ’F’ of ‘0’. E.g. f908’s address is 0x0908。

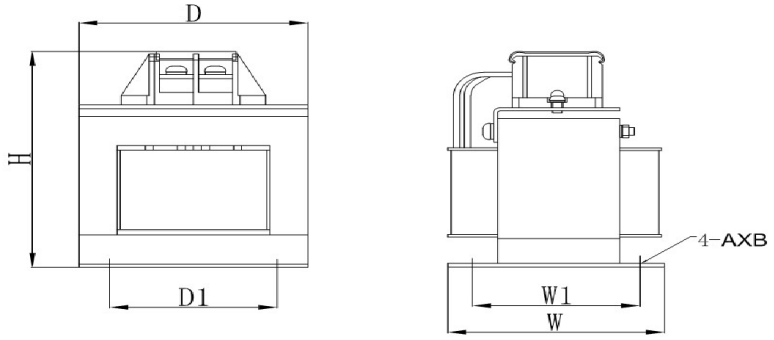
NO.	Parameter Name	Description
u000	CPU1 Version	E.g: v100, G-type, v= g; P-type, v= p ;
u001	Operation frequency	Value is displayed in Hz/free unit. See f604.

u002	Direction of rotation	0 Forward run, 1 Reverse run.
u003	frequency command value	Value is displayed in Hz/free unit. See f604.
u004	load current	The inverter output current (%/A) is displayed.
u005	input voltage (AC RMS)	The inverter input voltage (%/V) is displayed.
u006	output voltage (AC RMS)	The inverter output voltage command (%/V) is displayed.
u007	Input terminal status indicated	11kW or below:  : OFF i : ON. AI1-AI2 LI4 LI3 LI2 LI1 15kW or above:  : OFF i : ON. LI8 ··· LI3 LI2 LI1
u008	Output terminal status indicated	 , without T2 at 11kW or below
u009	cumulative operation time	(0.01=1 hour, 1.00=100 hours)
u010	Output speed	Displays the motor speed (min-1) by calculating with output frequency and pole numbers.
u011	Rated current	The rated current of the inverter (A) is displayed.
u012	Torque current	The torque current (%/A) is displayed.
u013	Load current	The inverter output current (load current) (%/A) is displayed.
u014	Torque	The torque (%) is displayed.
u015	Input power	The inverter input power (kW) is displayed.
u016	Output power	The inverter output power (kW) is displayed.
u017	PID feedback	The PID feedback value is displayed. (Hz/free unit)
u018	Frequency command value (PID-computed)	The PID-computed frequency command value is displayed. (Hz/free unit)
u019	Integral input power	The integrated amount of power (kWh) supplied to the inverter is displayed.
u020	Integral output power	The integrated amount of power (kWh) supplied from the inverter is displayed.
u021	Communication counter	Displays the counter numbers of communication through the network.
u022	Normal state communication counter	Displays the counter numbers of communication only at normal state in the all communication through network.
u023	Cpu2 version	v 1 0
u024	Parts replacement alarm information	 ON: Needs to be replaced
u025	Cpu1 revision	
u026	PID setting	Displayed in % term.
u027	PID feedback	Displayed in % term.
u1--	Past trip 1	Enter into the display of detailed information on past trip 1
u2--	Past trip 2	Enter into the display of detailed information on past trip 2

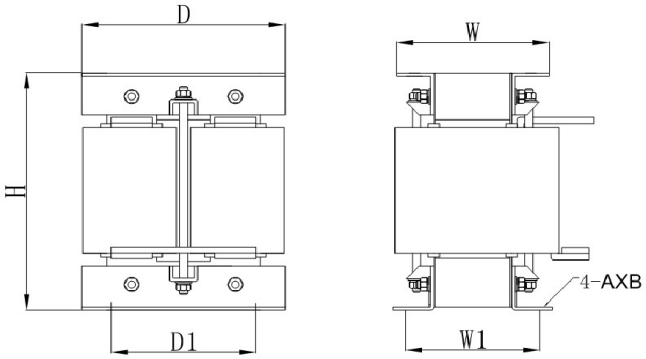
u3--	Past trip 3	Enter into the display of detailed information on past trip 3
u4--	Past trip 4	Enter into the display of detailed information on past trip 4

APPENDIX C: Peripheral Devices and Options

Reactor



Picture A



Picture B
Figure C.1 DC Reactor dimensions

Table C.1 DC Reactor (Three-Phase 400 V Class of Input 50/60Hz)

Type	Figure number	Power（kW)	Rated current(A)	Inductance (mH)	Insulation Class	External and mounting dimensions (mm)			
						L	D	W	W1
DCR-0010-6M30-0.4DC	A	4	10	6.3	F、H	100	80	100	70
DCR-0015-3M60-0.4DC		5.5	15	3.6	F、H	110	87	120	70
DCR-0020-3M60-0.4DC		7.5	20	3.6	F、H	110	87	120	70
DCR-0030-2M00-0.4DC		11	30	2	F、H	110	87	120	70
DCR-0040-2M00-0.4DC		15	40	2	F、H	110	87	120	70
DCR-0040-1M30-0.4DC		18.5	40	1.3	F、H	110	87	120	70
DCR-0050-1M08-0.4DC		22	50	1.08	F、H	120	95	135	85
DCR-0065-0M80-0.4DC		30	65	0.8	F、H	138	111	150	85
DCR-0080-0M70-0.4DC		37	80	0.7	F、H	138	111	150	85
DCR-0100-0M54-0.4DA		45	100	0.54	F、H	138	111	150	85
DCR-0120-0M45-0.4DA		55	120	0.45	F、H	155	125	160	90

Type	Figure number	Power（kW)	Rated current(A)	Inductance (mH)	Insulation Class	External and mounting dimensions (mm)			
						L	D	W	W1
DCR-0160-0M36-0.4DA	B	75	160	0.36	F、H	165	100	130	98
DCR-0200-0M33-0.4DA		90	200	0.33	F、H	165	100	130	98
DCR-0250-0M26-0.4DA		110	250	0.26	F、H	210	176	150	115
DCR-0300-0M26-0.4DA		132	300	0.26	F、H	210	176	150	115
DCR-0350-0M17-0.4DA		160	350	0.17	F、H	210	176	150	115
DCR-0450-0M09-0.4DA		185	450	0.09	F、H	220	191	150	115
DCR-0500-0M06-0.4DA		220	500	0.06	F、H	220	191	150	115
DCR-0650-0M05-0.4DA		300	650	0.05	F、H	230	208	160	125

AC Reactor (Three-Phase 400 V Class of Input 50/60Hz)

Motor Capacity (kW)	Type	Rated current (A)	Voltage drop (%)	External and mounting dimensions (mm)
1.5	VSC-0005-2M80-0.4SC	5	2%	105*89*135
2.2	VSC-0007-2M00-0.4SC	7	2%	105*89*135
3.7	VSC-0010-1M40-0.4SC	10	2%	105*89*135
5.5	VSC-0015-0M94-0.4SC	15	2%	105*89*135
7.5	VSC-0020-0M70-0.4SC	20	2%	105*89*135
11	VSC-0030-0M47-0.4SC	30	2%	148*110*135
15	VSC-0040-0M36-0.4SC	40	2%	148*125*135
18.5	VSC-0050-0M28-0.4SC	50	2%	149*130*133
22	VSC-0060-0M24-0.4SC	60	2%	190*130*158
30	VSC-0080-0M18-0.4SC	80	2%	190*145*158
37	VSC-0090-0M16-0.4SC	90	2%	190*150*155
45	VSC-0120-0M12-0.4SA	120	2%	220*155*210
55	VSC-0150-094U-0.4SA	150	2%	230*170*220
75	VSC-0200-070U-0.4SA	200	2%	250*175*230
90	VSC-0250-056U-0.4SA	250	2%	240*170*221
110	VSC-0250-056U-0.4SA	250	2%	240*170*221
132	VSC-0290-048U-0.4SA	290	2%	280*170*245
160	VSC-0330-042U-0.4SA	330	2%	285*175*240
185	VSC-0390-036U-0.4SA	390	2%	280*180*240
220	VSC-0490-028U-0.4SA	490	2%	315*217*305
280	VSC-0600-024U-0.4SA	600	2%	315*230*300
300	VSC-0660-022U-0.4SA	660	2%	315*230*300
400	VSC-0800-17U5-0.4SA	800	2%	365*280*390
450	VSC-1000-014U-0.4SA	1000	2%	365*280*390
500	VSC-1200-11U7-0.4SA	1250	2%	395*340*390

AC Reactor (Three-Phase 400 V Class of Output 50/60Hz)

Motor Capacity (kW)	Type	Rated current (A)	Voltage drop (%)	External and mounting dimensions (mm)
1.5	VSC-0005-1M40-0.4SC	5	1%	105*89*135
2.2	VSC-0007-1M00-0.4SC	7	1%	105*89*135
3.7	VSC-0010-0M70-0.4SC	10	1%	105*89*135
5.5	VSC-0015-0M47-0.4SC	15	1%	105*89*135
7.5	VSC-0020-0M35-0.4SC	20	1%	105*89*135
11	VSC-0030-0M23-0.4SC	30	1%	148*115*125
15	VSC-0040-0M18-0.4SC	40	1%	150*115*135
18.5	VSC-0050-0M14-0.4SC	50	1%	150*130*135
22	VSC-0060-0M12-0.4SC	60	1%	189*125*170
30	VSC-0080-087U-0.4SC	80	1%	189*130*155
37	VSC-0090-078U-0.4SC	90	1%	189*130*160
45	VSC-0120-058U-0.4SA	120	1%	220*147*310
55	VSC-0150-047U-0.4SA	150	1%	220*152*210
75	VSC-0200-035U-0.4SA	200	1%	250*175*230
90	VSC-0250-028U-0.4SA	250	1%	240*168*220
110	VSC-0250-028U-0.4SA	250	1%	240*168*220
132	VSC-0290-024U-0.4SA	290	1%	285*175*240
160	VSC-0330-021U-0.4SA	330	1%	285*175*240
185	VSC-0390-018U-0.4SA	390	1%	285*175*240
220	VSC-0490-014U-0.4SA	490	1%	315*215*310
280	VSC-0600-012U-0.4SA	600	1%	315*235*310
300	VSC-0660-011U-0.4SA	660	1%	315*235*310
400	VSC-0800-08U7-0.4SA	800	1%	315*230*310
450	VSC-1000-07U0-0.4SA	1000	1%	365*280*380
500	VSC-1200-05U8-0.4SA	1250	1%	395*325*390

Braking Unit

Sequence	Voltage	Type	Description
1	220V Class	VSC-CBU2015	15KW and below
2		VSC-CBU2022	22KW and below
3		VSC-CBU2030	30KW and below
4	440V Class	VSC-CBU4030	30KW and below
5		VSC-CBU4045	45KW and below
6		VSC-CBU4055	55KW and below
7		VSC-CBU4075	75KW and below
8		VSC-CBU4110	110KW and below
9		VSC-CBU4160	160KW and below
10		VSC-CBU4220	220KW and below
11	660V Class	VSC-CBU6220	220KW and below

Braking Resistor

Frequency inverter type	Braking Resistor	
	description	(value/power*quantity)
0.75KW/380V	Aluminum Power Resistors	750Ω/80W*1
1.5KW/380V		400Ω/260W*1
2.2KW/380V		250Ω/260W*1
4KW/380V		150Ω/390W*1
5.5KW/380V		100Ω/520W*1
7.5KW/380V		75Ω/780W*1
11KW/380V		50Ω/1040W*1
15KW/380V		40Ω/1560W*1
18.5KW/380V	RXHG	20Ω/6000W*1
22KW/380V		
30KW/380V		
37KW/380V		13.6Ω/9600W*1
45KW/380V		
55KW/380V		
75KW/380V		13.6Ω/9600W*2
90KW/380V		
110KW/380V		
132KW/380V	RXHG	4Ω/30KW*1
160KW/380V		
185KW/380V		3Ω/40KW*1
200KW/380V		
220KW/380V		
250KW/380V		4Ω/30KW*2
280KW/380V		
315KW/380V		
350KW/380V		3Ω/40KW*2
400KW/380V		
500KW/380V		2Ω/60KW*2
560KW/380V		
630KW/380V		

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